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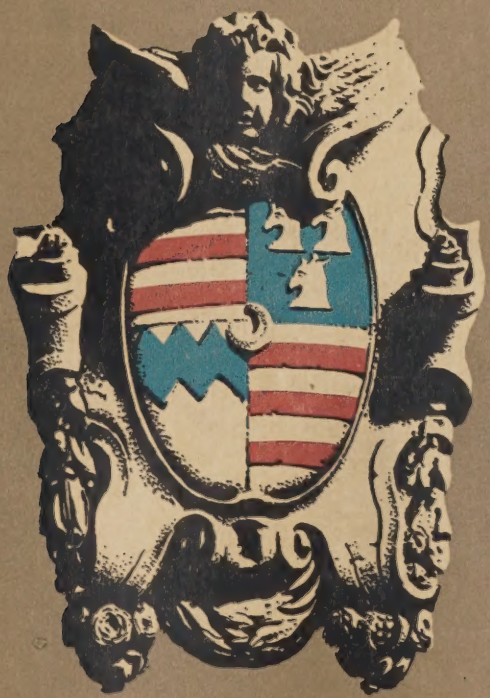

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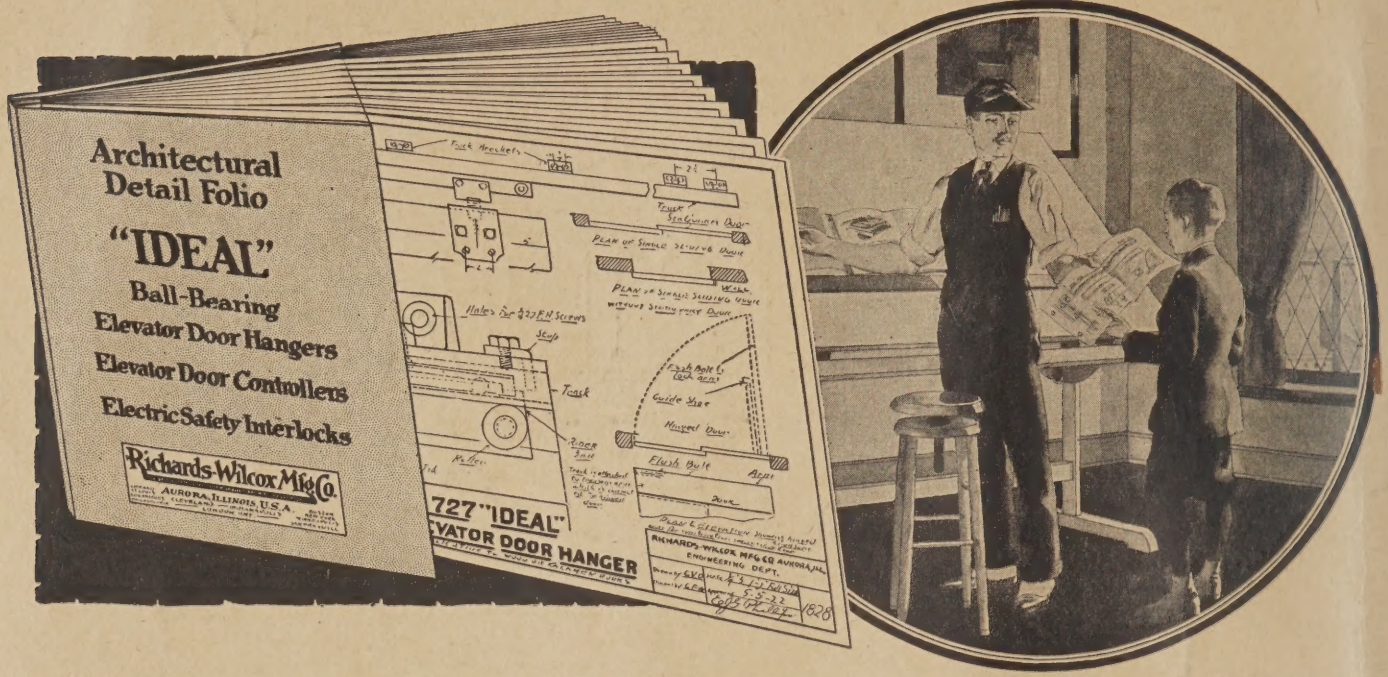

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BOOK DEPARTMENT

A Work on the Mediaeval Sculpture of France and Spain

ROMANESQUE SCULPTURE OF THE PILGRIMAGE ROADS. By Arthur Kingsley Porter. Ten volumes; one volume of text and nine of half-tone illustrations. 6½ x 9 ins. Price $150 net. Marshall Jones Company, 212 Summer street, Boston.

THE decay, during the tenth century, of the civilization fostered by Charlemagne and the general reign of social disorder throughout Europe led to a dread of the approach of the year 1000, the millennium, when mankind looked for the end of the world, and there came a return of hope and a renewal of building energy when the dreaded day had passed. Raoul Glaber, a monk of Cluny, has left an account of the revival of architecture after the year 1000. The whole world, he says, as with one accord seemed to cast aside its tatters of age and to clothe itself in a white mantle of churches.

About the beginning of the eleventh century there spread throughout western Europe the art movement which is generally called Romanesque, which held sway for about a century and a half and had reached its period of culmination when about the middle of the twelfth century it gave way to the movement which we know as Gothic. Although other terms have been used in referring to the movement, the term "Romanesque" seems to be particularly appropriate since it implies in matters relating to art and architecture much as does the term "Romance" when applied to movements having to do with language and literature; the period was a time when the provinces which had constituted the crumbling Empire of the West were taking on something akin to their modern forms and were establishing themselves as states, all having a common Roman origin.

Rome gave to western Europe the basilica plan which Christianity had taken over from pagan antiquity, and upon this plan Europe for centuries continued to build its churches as oblong halls with small apses at the ends. The hall or nave consisted of a central vessel with side aisles divided therefrom by piers. The arrangement of the plan, the vaulting, and the method of laying stone were Roman, but Byzantine influences were powerful in matters of ornament and design. It is not always easy to realize how powerful an effect upon European art flowed for centuries in a never-ending stream from Byzantium. New Rome was preoccupied with affairs of her own and exerted but small influence over the political fortunes of the West, but placed midway between Europe and Asia and filled with the mystery and splendor which were part of her dower, Byzantium poured over all of western Europe her potent influence upon art forms, and especially upon forms of architecture and of sculpture which was regarded chiefly in its relation to architecture. The influence of the East upon the art of western Europe was strong in directing the progress of the Romanesque movement in Italy, Germany and Britain, and particularly in Spain and what are now the southern provinces of France, and among the most precious of the treasures which former ages have bequeathed to the modern world are the Romanesque sculptures of southern and western France and northern Spain. Surprisingly rich is the bequest, for the extent of the work in sculpture in this rich region was so vast that even after allowing for the ravages of centuries the splendor of the legacy is almost beyond the bounds of the imagination.

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VENTILATION. Report of the New York State Commission on Ventilation. Prepared under direction of the Commission, C.-E. A. Winslow, Chairman. 620 pp., 6¾ x 10 ins. Price $15. E. P. Dutton & Co., New York.

RESEARCH in many fields of activity has demonstrated the effect of atmospheric conditions upon occupants of schools, hospitals, factories, theaters and other places in which numbers of people congregate, and it has invariably been found that mental alertness, no less than physical comfort, depends upon the condition of the air as well as upon the prevailing temperatures. As far as we know, however, there has been no effort to collate upon an adequate scale the results of these different studies and experiments, and still less a definite attempt to draw from these results any data which would render the studies productive of improvements in working conditions. This important work has at length been undertaken by a commission appointed by the governor of the state of New York at the request of the New York Association for Improving the Condition of the Poor, and supported by the Milbank Memorial Fund, established and endowed by Mrs. Elizabeth Milbank Anderson.

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SMALL HOUSES OF THE LATE GEORGIAN PERIOD, 1750 to 1820. Volume II, Details and Interiors. By Stanley C. Ramsey and J. D. M. Harvey. 19 pages of text, 100 plates, 8½ x 12½ ins. Price $10. William Helburn, Inc., New York.

PERHAPS it is due to the wholesale destruction of London's old residence quarters, its venerable parks, crescents, squares and places, rumors of the dismantling of which reach America, that there is growing appreciation of the rapidly vanishing architecture of the eighteenth century, together with efforts to put into permanent form records of much of the work. With Devonshire House eking out a precarious existence, Hamilton Palace dismantled, and Stowe House being remodeled into a public school, there is evident a need for recording of this data if there is not to be complete obliteration of even the memory of much of the architecture which made the Georgian period notable.

The favor with which the eighteenth century regarded its architectural forms was based upon the same foundation which secures the use of the identical forms today,—dignity and simplicity, to which were added architectural value and coherence. This old work well expresses the character of the English—a presenting to the world of a well mannered, dignified exterior, occasionally a trifle monotonous, but always accompanied by qualities which redeemed monotony or at least made it appear to be well balanced form. But once acquaintance was made, and the house entered, there were discovered a host of delightfully winning characteristics which made bright, sunny and often lovable what seemed at first a trifle austere.

This volume completes the authors' presentation of small houses built during the latter half of the eighteenth and the early part of the nineteenth centuries. Volume I dealt with exteriors, while the present volume treats of interiors of the period and gives drawings from which there could be reproduced many of the details of interior architecture which added to their interest and beauty. Besides the excellence of their planning the architects of the time were notably successful in their designs for gracefully detailed woodwork—mantels, stairways, wainscots, door and window trim, and the columns and pilasters which they understood so well how to use, in addition to such details of ironwork as fanlights above doorways and guards at the sides of staircases, and such plaster details as modeled friezes and ceilings, and this volume includes countless drawings which will be of practical aid to modern architects.

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HANDBOOK FOR ARCHITECTS AND BUILDERS. Published under the auspices of the Illinois Society of Architects.

OF goodly size and of broad scope is the 25th edition of the Handbook. In this annual publication there is presented a resume or summing up of architecture and building in Illinois, but while the value and interest of the work are always great, the interest and value are this year intensified.

For many months the office of Chicago's corporation counsel has been in collaboration with a special committee of the city council and with representatives of various organizations and interest in a revision of the code of the City of Chicago, which includes the city's building ordinance. Countless necessary changes were made; the sections relating to the fire prevention bureau and the health department have been taken out and placed in the provisions regulating those activities. Ordinances heretofore known as "special ordinances" have been placed in sections where they properly belong. All these changes have necessitated a complete change in the section numbers of the code, and a far more complete and comprehensive building ordinance is the result. The index to this revised ordinance as necessarily rearranged is published in the Handbook, and since it will be some months before it will be printed and issued by the city, the index as here presented constitutes the sole guidance to those who should use it. Other information adds to the value of this work. Besides data relating to the Illinois Society of Architects, naturally included in its annual publication, such as the condensed history of the organization, a review of its "Canons of Professional Ethics" and the "Schedule of Charges" which the society adheres to, there are data relating to the local chapter of the A. I. A., the Chicago Architectural Club, the Building Construction Employers' Association and the Associated Builders.

A considerable part of the value of this annual volume consists in its presenting in concise form information which architects require but which is usually to be had only by looking it up from many sources. This year the Handbook contains in full the "Illinois Architectural Act" (licensing law); "Extracts from the New Civil Administration Code of Illinois;" "Office Practice" adopted by Illinois Society of Architects; "Suggestions for Firms Issuing Catalogs and Printed Matter;" "Wage Scales as Affected by the Landis Decision;" "Mechanics Lien Law;" "State Zoning Law," and many other details of importance to those for whose use the work is issued. The Handbook for Architects and Builders is delivered free of charge to offices of all architects licensed to practice architecture within the limits of the state of Illinois.

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BY action of the faculty, the Harvard School of Landscape Architecture is empowered to announce a full course in city planning leading to a master's degree,—an M.L.A. in the field of city planning. This will be one of two options offered to students entering the school in September, 1923, the other option fitting a man for private problems of landscape architecture, especially estates and gardens, and for designing parks and pleasure grounds.

FOR APPRENTICES' TRAINING

A HIGHLY practical movement toward the training of skilled mechanics for the building industries is the establishment of scholarships for the instruction of workmen. The April, 1923, agreement between the Tile and Mantel Contractors' Association and the Bricklayers', Masons' and Plasterers' International Union makes provision for the establishment of an apprenticeship system, and to aid in the training of workers in tile-setting the Associated Tile Manufacturers have prepared a basic course in tile-setting, while in order to demonstrate the practicability of the course and to furnish a groundwork of experience to the country arrangements have been made with Dunwoody Institute, Minneapolis, to give the course to a selected group of young men.

The expense of this is borne by the Association, and the course extends from June 4 to August 31, inclusive. Details may be had upon application to the Educational Dept., Associated Tile Manufacturers, Beaver Falls, Pa.

WINNER OF ROTCH TRAVELING SCHOLARSHIP

THIS highly prized scholarship for 1923 was recently awarded to Isidor Richmond of Boston, for his drawings and plans for a group of buildings suitable for the embassy of a national government in some foreign capital. The Rotch Traveling Scholarship, founded in 1883 by the children of the late Benjamin S. Rotch of Boston, and administered by the Boston Society of Architects, provides for a two-year period of travel and study by the winner.

Mr. Richmond received his architectural training in the atelier conducted by the Boston Architectural Club, in the offices of Cram, Goodhue & Ferguson, Guy Lowell, Bellows & Aldrich, and William G. Perry, Boston, Felix A. Burton, Brunswick, Me., and at the Massachusetts Institute of Technology. Mr. Richmond also spent some time in the offices of the Cleveland Board of Education, and during 1920 worked upon the restoration of Rheims Cathedral.

ZONING FOR PROVIDENCE

THE adoption by the City Council on June 6 of a zoning ordinance assures for Providence proper supervision covering such points as height, area and use of buildings. The ordinance was examined closely by hundreds of citizens whose property is affected, and yet no opposition to the restriction developed. The committee in charge had the benefit of expert knowledge on zoning, and before laying out the districts every part of the city was inspected. The municipal government asks that citizens cooperate with the Inspector of Buildings and the Board of Review in carrying out the provisions of the zoning ordinance.

TWO SCHOLARSHIPS

THE 1923–24 award of the Plym Fellowship in Architectural Design was to Edward L. Hubbell of Los Angeles. This fellowship at the University of Illinois was founded some ten years ago by F. J. Plym, of the Kawneer Company. Mr. Hubbell is the son of an architect and was graduated at the University of Illinois in 1921. After a year of postgraduate work he began the practice of architecture.

THROUGH the generosity of George G. Booth of Detroit there has been established a scholarship in the College of Architecture of the University of Michigan. The scholarship, which will be awarded for the first time at the end of the academic year of 1923–24, will provide the winner with $1,200 for a period of work and observation abroad. The successful candidate is to be chosen by the architectural faculty on his record as a student, ability in design, and fitness for doing independent work abroad.

ALABAMA MARBLE COMPANY COMPETITION

MENTION was made upon this page of THE FORUM for April of a traveling scholarship established by the Alabama Marble Co., the winner to receive the sum of $1,800 for ten months' travel to study and record the use and treatment of marble in the buildings of Europe.

Announcement is now made of the character of the problem for the initial competition, the building being a small bank, the details of which may be had upon application to Walter D. Blair, 154 East 61st street, New York. The competition will be conducted under the guidance of the Committee on Education of the American Institute of Architects, and the jury is composed of Donn Barber and Burt L. Fenner, New York, R. Clipston Sturgis, Boston, Paul Cret, Philadelphia, and Abram Garfield, Cleveland, who will decide upon the winner of the competition.

A Partition Within a Partition

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LA VIEILLE RUE, MENTON, FRANCE

A paved way to the cathedral, with houses on the left bordering the sea.

FROM PHOTOGRAPH BY J. GILETTA

The
ARCHITECTURAL
FORUM

VOLUME XXXIX JULY 1923 NUMBER 1

Some Alluring Cities of Old France

By GEORGES BENOIT-LEVY
Director, Garden City Association of France, and Author of Books on City Planning

WEST of Paris, nearly on the coast of Brittany, out of an immense forest and rosy heath moors, halfway between the famous Mont Saint Michel and the mediæval borough of Vitre, stands a feudal castle, full of mystery and famed in thrilling legends. Razed to the ground in 1166 by the English, ransacked by them in 1449 with a pillage of over a quarter-million worth of actual dollars, rebuilt anew during the twelfth, the thirteenth and the fourteenth centuries—from generation to generation it has been whispered that a treasure was buried in the undermost depths of the first ruins. That stronghold, together with the industrious city which commands it from the other side of the vale, is Fougeres.

Fougeres is named from the many ferns which adorn its adjoining 3,000-acre forest. Fougeres, with its 20,000 inhabitants, notwithstanding its manufactures of shoes, glass, linen cloth and dye, has retained all the quietness of the times gone by and will always remain a precious thing, bearing in its faded hues "the tenderest memories of the past, like a sweet and lingering perfume of dead flowers." The essential beauty of this and others of these towns of another age is that from far away they appear as perfect and harmonious ensembles, and the peculiarity of Fougeres is that both the castle and the city have their own enclosures, high walled, rising from a brook streaming among shrubs, trees and greens of every description. That brook is called *Nancon*. Into the walls of the city, houses are built; the entrances are on the back street called *rue Pinterie*.

I climbed that *rue Pinterie* and by the *place Gambetta* I arrived at *rue de la Foret*. When I had reached No. 56 of that street I stopped and knocked at a strong door, waiting for M. Albert Durand. A charming man indeed, M. Durand, a photographer, a lover of his country, and altogether an erudite. Go to him; you need not bother about books, scripts or papers concerning the place. He, the mayor, and M. Pautrel, president of the archæological society, are living encyclopedias of all information touching what they are pleased to call the *tryptique*, Vitre, Mont Saint Michel, and Fougeres.

Photo. A. Durand

La Porte Notre Dame, Fougeres

"I am in a rush," said I. "I'll take my hat and my camera, and I am yours," said he. And then, wandering up and down, we passed through crooked streets, with zigzagging houses and quaint names. Here is the public garden, called *place aux arbres*, from which we had an extended view; there is the eleventh century church of St. Sulpice; on one of its doors is carved the fairy Melusine combing her hair in front of her looking glass, just as she appears in the arms of the lord of the manor, "the Lusignan." Farther on, we passed the belfry, the *rue du Fos-*

keraly, the *rue Porte-Roger*, the *rue des Feuteries*, the *rue des Vallees* leading to the monumental staircase of "The Duchess Ann," by which we were nearing the *place Raoul II*—and now we enter *le chateau*.

We jogged among the ruins, the three enclosures of the castle, the gardens and the grounds; we ascended the watch walls and the towers; we bowed to the remains of the dungeon and of the lordly hall. How happy was I not to be bothered by the dithyrambs and the recitals of the regular guide! M. Albert Durand spoke slowly, carefully. As we went along, he named for me the 13 towers, some in a bad state, some others well preserved. "There they are," he said, "*La Tour Carree de la Haye St. Hilaire, La Tour de la Tremoille, La Tour du Hallay, La Tour de Guemadeuc, La Tour de Coetlogon, La Tour de Cligny, La Tour Carree du Cadran, La Tourelle de Guibe, La Tour du Gobelin, La Tour Melusine, La Tour d'Amboise, La Tour Raoul.* Our ancestors took centuries," said M. Durand, "for building such marvels as these, and centuries will vanish before they disappear from the earth."

Photo. A. Durand

Old Houses on City Wall, Fougeres

Photo. A. Durand

The XII Century Tour de la Haye St. Hilaire, Chateau, Fougeres

Let us leave the magic and enchantment of Brittany and reach, full speed, the smiling borders of Provence. Here we are now, on *La Cote d'Azur*, flying from steeple to steeple,—Vence, La Roquette, Breil, Aspremont, all of you, old cities so near the blue coast, you seem all taken by an aerial photographer! And yet every rambler on the mountains of Les Alpes Maritimes can see you, at a distance, as you appear in these illustrations, a composite picture of the city beautiful.

Blue, white, red, like the flag of France, are your skies, your houses, and your roofs;—every kind of blue, from the ever-changing hues of the Mediterranean to the light green of the lemon foliage and the darker leaves of the olive trees;—every kind of white, from that of the immaculate sea foam to the gray rocks of the garden walls, which climb, terrace by terrace, like a flowered garland toward and around the houses which are built in the city walls, which are made and often dug out of the same rocks;—every kind of red, from that of the crimson roses to the pink sunsets and the reddish tiles.

Indeed, it would be a real trick to ascribe a style to these cities. They grew out of the necessities of life; their conformity to their geographical and historical developments is their one and only merit; they are a living demonstration of Ruskin's saying, "Nothing is beautiful which is not useful," and of the Latin motto, "*et nos in Gallia, utiles et dulces;*"—"we, in France, we like things both useful and beautiful." First, they are mountain towns, originally

Photo. A. Durand North Wall of Chateau, Fougeres, XIII Century

out of easy access, and therefore obliged to use materials available on the spot;—ashlar for the walls, flagstones for the floors, heavy timber for the posts and the roofs. Face walls and partitions are sturdy, sometimes 3 feet thick, and such as they were erected eight centuries ago. Quite different is that seven-story apartment house which the other day I saw in the *boulevard Gustave Desplaces*, at Nice, entirely walled up with 5-inch hollow tiles! Our ancestors knew how to build! Necessity was their best master!

These old cities are parts of the landscape; they are features of it; they are bound to it. At Peille the church is at the summit of the village, and its floor is the crag itself. There are no sidewalks in the streets; they are too narrow for that, but they are paved with blue and gray cobblestones, and when it rains they are flushed from top to bottom in such a manner as to render envious the most clever municipal engineer, provided with the most elaborate devices. When the ground is level, you find sometimes red flagstones on cement pavements. It is worth going to the *place* of Menton's cathedral from where you have a framed vista plunging into the sea toward the peninsula of Bordighera. If you allow your eyes to look down, you then notice that you stand on a marvelous mosaic of black and white pebbles, embossed upon the ground some two centuries ago.

Another reason for these towns' being highly perched was the necessity of self-defense. I will not retrace the history of the 159 communes of the Maritime Alps, although I know most of them. I do not forget that we are today wandering and not professing *ex cathedra*. If you want to know more about them, call at my Menton studio and we will tramp around. We will go to the municipal library at Nice and speak to its very learned curator, or to the curator of Menton, and interview M. Magaglyo, a son of the land. We might have a chat at the Nice tourist syndicate with Mr. Farraut, or knock at the Menton residence of M. le Marquis de Montleon; here, I have been handling the ten-kilos, calfskin bound "Historical Lexicon" of Gioffredo, the Durandy's splendid books,—"My Country" and "The Garland of Venus," the Charles Morice "Blue Land" and so many others!

In the meantime we will make a choice of only a few instances among the many:

Aspremont, seven miles north of Nice, 1,600 feet altitude, on the slope of the Mont Chauve, the *Castrum Aspermontis* of the Romans, is thus named from the asperity of the place. On the high crest, ruins of the homes built by the Vediantii tribes may still be found. Later on the inhabitants went down

Photo. A. Durand Half Timber Houses in Fougeres

Photo. J. Giletta

View of La Roquette from Approach to the Town

into the flat country, but terrified by the plague of 1327 they built anew on the slope of the Mont Chauve, at an altitude of 2,500 feet. They disinfected it by burning it; they created the actual Aspremont in 1327. The city is thus six centuries old.

Vence, eight miles northwest of Nice, is the city in a garden. Violets, roses, geraniums, all the flowers and all the fruits, give to the soft winds which caress Vence a rare perfume. The old borough was successively a Roman camp, a mediæval stronghold, a glorious bishopric. The town is surrounded by a former watchway, and then rises in a labyrinth of narrow streets which are often tunnels. The cathedral dates from the twelfth century, and its choir from the sixteenth. Here and there you find on the walls *graphiti* and inscriptions in Latin or Merovingian, in Italian or in French, in Arabic or in dialects. There are Roman arched doors and houses of every century. Some of them, the *maisons Fouques* and *Serraires* of the sixteenth century, have beautiful carvings inside and possess splendid fireplaces with ornamental designs in stucco.

Photo. J. Giletta

Street View in Aspremont

La Roquette is another out-of-the-way place, set out as a gem among forests of olive trees and gardens which you see from far away as you walk along the road running at its base.

And what shall we say of Breil, Breglio, at the outside of the ravine of Saorgio, between the passes of Giou and Brouis, near the Italian boundaries! At an altitude of 900 feet it commands the refreshing valley of La Roya. Its name

explains its history, as it comes from *praelium*, which means "fight." It was built in a predominant situation for securing for its inhabitants the safest defense. The height of Breïl was called Cri-Bella, from where the first signal was given when the soldiers of Othon were seen entering the ravine; the lowest part was called Piazza-Rossa, where the bloody fighting was done. Over the torrent stands a three-arched stone bridge, built in 1546. At the foot of the old borough, built for defense, the gay and rustic hamlet of Giandola expands among orchards and meadows.

Photo. J. Giletta

A Street in Menton

Thus all the races of the world,—Roman, Moorish, Spanish, Italian and French,—have been fighting and fighting in these blessed spots, like men anxious to win a fair maiden; protection against attacks was one of the factors determining the architecture,—high buildings, narrow streets, girdles of stones. That much-regretted professor, Mulford Robinson, had a sensible view of that when he wrote: "To be sure, the town was a sturdy young fighter, against foes of its own kind. It was, in truth, a real child-city, playing well, and when tired, sleeping well."

Among the old towns of the Maritime Alps, Menton is the one which affords the best idea of the kind of historical conditions which underlie their architectural development. The primitive parish, one mile west and north from actual Menton, was designated under the name of Pepin or Puypin, from the Italian *Poipino* and from the Latin *Podium Pinum*, the "mount of the pines." When the attacks by the Moors became less frequent, in 1200, people migrated nearer the sea and occupied the mount, Othon belonging to Count Othon, wherefrom: Montone, Mentone, Menton. That name was mentioned for the first time in proceedings of 1250, when the then owner of the mount, Guillaume Vento, asserted his rights. The same lord built his castle on the height of the actual cemetery, and encircled the remaining heights in order to erect what is now *la vieille ville*, a maze of intricate

Photo. J. Giletta

The City of Breil in the Valley of La Roya

Photo. J. Giletta

Distant View of the Town of Vence

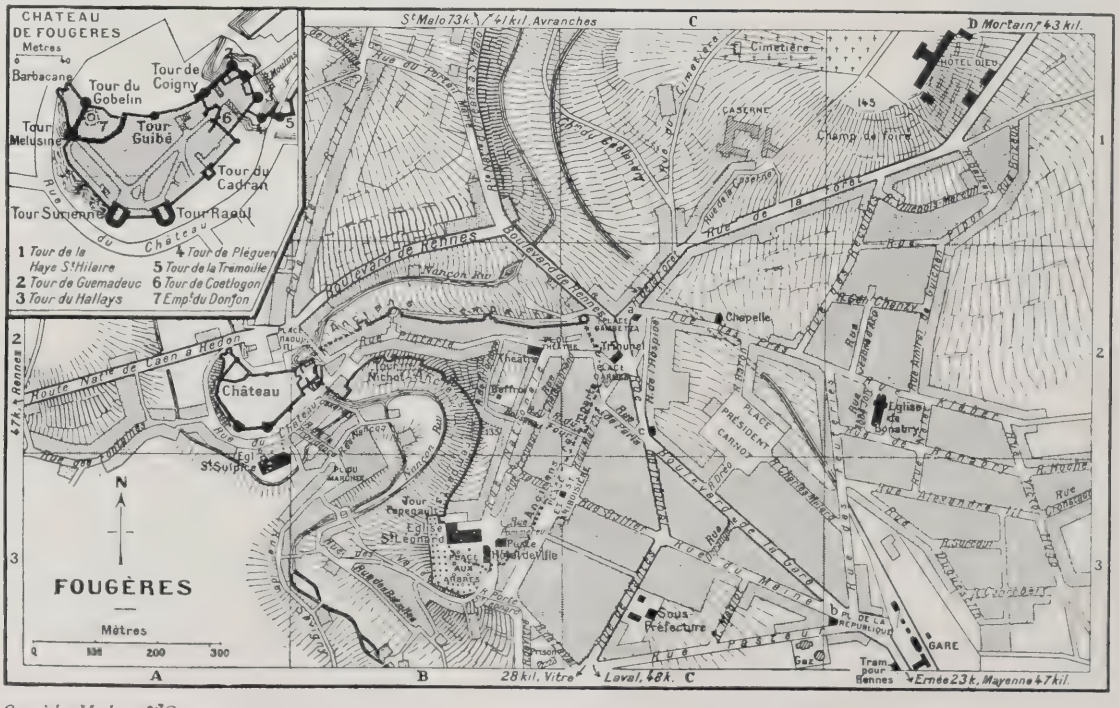
streets, deeply embanked between four- and five-story houses, plastered over their ashlar, painted in blue, in gray or in flaming red. As the conditions became safer, at the foot of *la vieille ville*, down the steps of the cathedral, was added *la rue longue*, a narrow thoroughfare, with houses four stories high on one side, and six or seven stories on the side of the sea. In that street the nobility took up their quarters, having one eye on the church and the other on the offing. Farther on, Menton extended along the sea, down the valleys and up the hills.

It is very curious to see, successively, the different houses which have outlived the centuries, in their state of dirt but of sturdiness, elbowing one another in brotherly fashion, and the modern villas, detached, inviting, cheerful, but very often built with thin walls and cheap materials. The features common to all kinds of houses are the green shutters, with their *portissols* cut out in the lower parts.

From my Garavan garden, where I dictate these lines, I am surrounded with fragrant gardens, with their olive groves, sloping down toward the sea,—while, westward, through the branches of rose bushes, of lemon groves, of peach blossoms, the spires of the churches emerge from the gray silhouette of *la vieille ville*, sluggishly lying under the yews of the cemetery. And then there come to my lips the verses of Magaglyo, that son of Menton:

M arvel of color, of vernal grace.
E nchantment. Splendid jewel. Blessed land.
N est of perfumes, of joy and of love.
T emple of Flora. Palace of light. . . .
O ther lands are not, with such an azure sky. . . .
N o country is so fair, no prospect is so clear.

What Magaglyo wrote of Menton would apply, to some extent, to most of these child-cities. When we build anew, let us not forget their "marvel of color and their vernal grace."



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Plan of Fougeres

Cape Cod Farm and Village Houses

By EDWARD SEARS READ

Illustrated from photographs by the author

THE earliest Cape Cod houses, most of which were built by settlers from the Pilgrim colony at Plymouth, were located along the "King's Highway," which was commenced in 1637 and ran along the north coast from Plymouth to Provincetown. Two types are prevalent: the early one-storied farmer's cottage, and the later and more expensive two-storied house as generally found along the main streets of the villages.

Fig. 1. House at Dennis, Mass.

The first farmhouses were very small and consisted of but a single room with a great brick chimney and fireplace. Later on, a duplication of this room, with the chimney on the partition, was added. As the settlers became more prosperous other rooms were added in a second story, and later still more room was obtained by building on across the back of the house a lean-to room, which continued the slope of the main roof. In the earliest type of plan the front door opens into a small entry, which contains a winding stairway against the central chimney up to the rooms above. When the later houses were elaborated and boasted chimneys in the end walls, this entry was extended from the front to the back of the house.

One of the most interesting features of the Cape Cod house is its interior. In the simpler farmhouses one may look for vertical boarded wainscoting, often matched and moulded in different ways, hand-hewn corner posts and chamfered summer beams, and also for extra wide, hand-split plank flooring. Even the doors may be unplaned planks, battened or dovetailed together with latches and catches of wood. In the more elaborate village houses of the later period one finds more plaster in evidence. Posts and girts are cased in, doors are paneled and hung with hand-wrought hinges, flush with the casings which were also set flush with the plaster. The fireplace walls are always of especial architectural interest. They are usually paneled with white pine, run in the customary bead and bevel moulding. Under the mantel one often finds, besides the main fireplace, a Dutch oven with iron door. In the fireplace hangs the crane with pot hooks and kettle.

Fig. 2. House at Dennis, Mass.

As good examples of the one-storied Cape Cod farmhouse with center chimney, we have selected two cottages at Dennis. Of particular interest are the pilastered doorways which are usual in this vicinity, as is also the dentil moulding below the cornice. The first illustration shows a rather unique type of corner quoining; the turned fence posts of the front yard are common in this part of the Cape. The second Dennis cottage has a very well proportioned facade; one of

Fig. 5. House at Chatham, Mass.

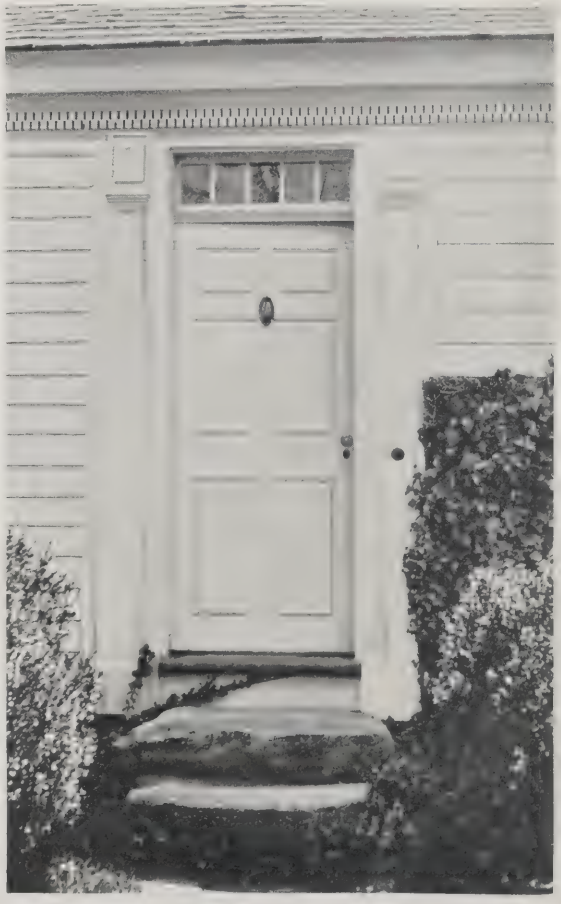
Fig. 6. House at Chatham, Mass.

the front rooms boasts an unusually fine example of wood paneled chimney breast with built-in, glass-doored china cupboard, many of which may be found in this vicinity.

The two farmhouses at Chatham are of still different types of the one-storied cottage. Fig. 5, with the gambrel roof, is the oldest house in the town. Fig. 6 shows a "rainbow roof" cottage, a type originally plentiful on the Cape. The curved rafters were bowed out like ribs of a ship, and were possibly inspired by the local shipbuilding industry.

Our first example of a two-storied house is located at Santuit, on the state highway along the south shore of the Cape. The pedimented doorway with its delicate modillions and double row of dentils is unusually rich in detail. It will be interesting to compare this house and doorway with those illustrated in Figs. 9 and 10, the house at Yarmouth Port. Here the pediment is broken and enframes an arched transom with leaded glass of a later period than its 24-light windows. The houses at Marstons Mills and Yarmouth are good examples of the "lean-to" type with central chimney, the former having an unbalanced and the latter a balanced facade.

Owners of later houses of the two-storied type were not content with unprotected doorways, and porches of various types were added. The porch of the house at Yarmouth (Fig. 13) is enclosed and



Figs. 3 and 4. Doorways of Houses at Dennis, Mass.

Figs. 7 and 8. Doorway and General View of House at Santuit, Mass.

forms an entrance vestibule. This house still retains its original blinds with heavy wood slats and no center rail, although the original sash have been removed. Here we find turned fence posts, as in a previous example. In connection with blinds, one of the charms of the Cape Cod house is the beautiful blue-green color with which the blinds and doors are painted. Few people realize that this color has been evolved by conditions of the local climate. In the salty ocean winds the original green has weathered down to an unusual shade which varies from turquoise to emerald, and is as brilliant as either.

During the days of the whaling industry many of the sea captains became very wealthy, and erected more elaborate houses than had been afforded up to that time. Instead of the usual shingled walls, clapboards now appear, also modillioned cornices and projecting, columned porches. Figs. 14 and 15 illustrate houses of this type. The first is on the main highway at Brewster, and was built by Captain Snow who was one of the original "committee of safety." This house is of the four-room type, each room with separate chimney on the outside wall, which in this case is of exposed brick, painted. A very delicate rope moulding forms the first member of the main cornice and also occurs in other parts of the finish.

The chimney of an old Cape Cod house is always an important affair; sometimes it becomes almost the most important part of a building, for where it takes the form of a "staek" chimney it may well occupy an area of considerable extent. A stack

Figs. 9 and 10. Doorway and General View of House at Yarmouth, Mass.

Fig. 11. House at Marstons Mills, Mass.

Fig. 12. House at Yarmouth, Mass.

chimney is one generally placed at the center of a house, and of so great a size that it often serves six or even more fireplaces which are themselves often of goodly proportions. The Cape Cod builders were almost always successful in constructing their flues so that they would "draw," and many ingenious methods were adopted for connecting into one huge chimney flues from so many different fireplaces. Sometimes the bulk of a stack chimney was so great that at its center there would be built a sort of secret storeroom called a "glory hole," the walls of course wholly of brick, and the vaulted roof also of brick. Cellars under the old Cape Cod houses are unusual. Instead of a cellar use was made of a circular well or pit about 6 or 8 feet deep.

Fig. 13. House at Yarmouth Port, Mass.

Fig. 14. House at Brewster, Mass.

Fig. 15. House at Falmouth, Mass.

The Hotel Statler, Buffalo

GEORGE B. POST & SONS, ARCHITECTS

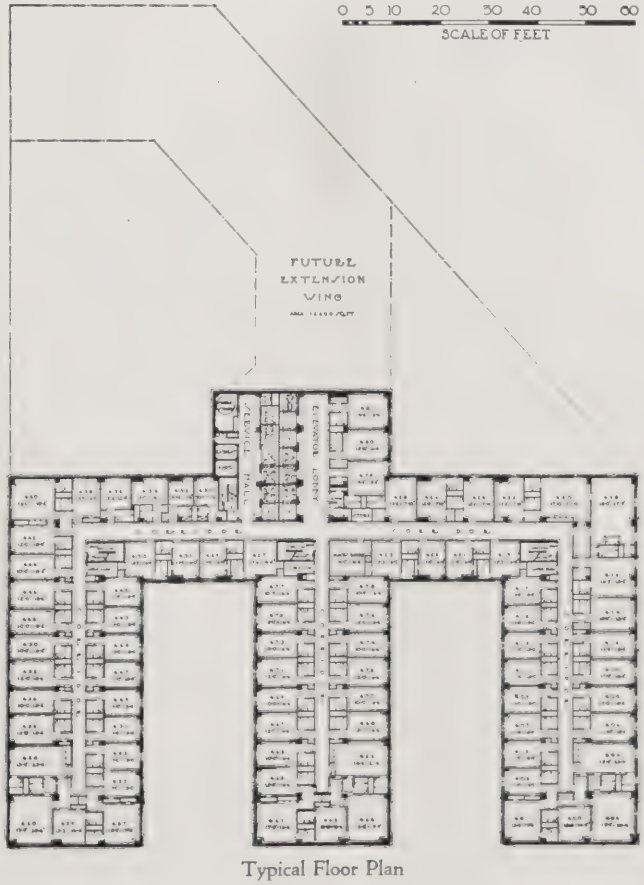
IN studying the plans of many recently completed buildings of institutional and investment types, it becomes obvious that a fundamental change is taking place in the procedure of the architect's office when such problems are undertaken. In the past there has been exhibited a strong tendency on the part of designers to think first in terms of the architectural design and general plan, with an ultimate moulding of the functional requirements of the building toward a compromise which tends to impair its efficiency of purpose. A long period of practical experience indicates that the more successful method in designing buildings for a specific purpose is to spend much more time on thoroughly establishing the functional requirements of the tenant, and to use this information as an arbitrary guide in so planning the building that it will meet these requirements.

One of the best examples of the working of this practical method of developing plans is to be found in the Hotel Statler recently completed in Buffalo, and replacing for that city the old Hotel Statler which was the first of the well established chain of Statler hotels. As might be expected, this building represents the results of experience in hotel planning, and while it presents no radical departures or theoretical experiments, it is a structure most efficiently planned through the co-ordinated efforts of one of the world's most successful hotel organizations and architects having many years of broad experience in this type of work.

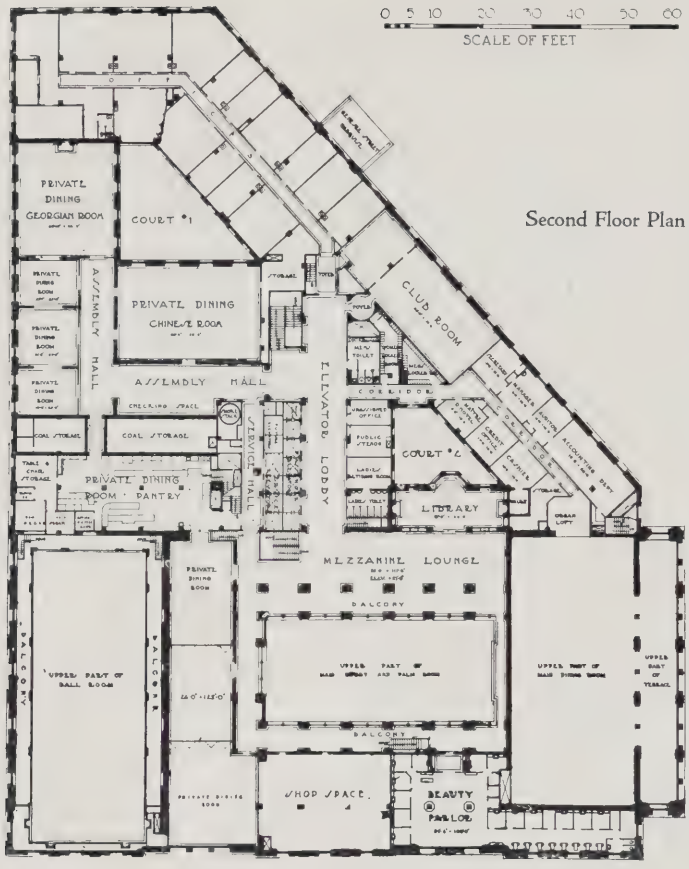
The building is located in attractive surroundings, facing Niagara square, and built on a plot of irregular shape covering approximately 79,000 square feet. The exterior architecture is of modified Georgian type in reddish face brick trimmed with terra cotta. An examination of the plan will show that a 20-foot setback has been established above the second floor in order to preserve the general character and openness of Niagara square. The hotel faces on five streets, with its main entrance on Delaware avenue, which carries the important vehicular traffic of the district, and with another entrance on the opposite side of the building which faces the more important business section of the city.

Passing through the main entrance on Delaware avenue, a broad interior entrance stairway leads to the level of the main floor lobby which extends directly through the building to the entrance on Genesee street. It will be noted in the arrangement of the lobby plan that there is a practical separation of office and working quarters from the main elevator and lounge section. This eliminates much confusion and effects a natural division between those who have business to transact with the hotel and those who are making use of the lounge and general lobby facilities. The passenger elevators are well located in respect to the offices, and different sections of the business department are carefully interrelated in their locations to meet the specific requirements of administration. By a carefully studied variation of levels on the main floor it has been possible to introduce a series of stores on Delaware avenue and on the Franklin and Genesee street sides, all of which represent logical rentable space.

The ballroom and the main dining room are two full stories in height. The interior architecture and decorations of the main lobby and palm room are carried out in Italian renaissance style with walls of Botticino marble which establishes the general decorative color note. The ceilings are of simple, flat vaulted type with penetrations at arches and are finished in plaster with decorative ribs at each pier. The floors are of terrazzo with brass stripping, and the electric fixtures are of wrought iron and gold in designs of the period. Probably the most striking features in these rooms, from an architectural viewpoint, are the double arches around the mezzanine and the main room entrances. The furniture and draperies throughout are of sim-



Typical Floor Plan



Second Floor Plan

is of travertine. The ceiling is of the heavy beamed and polychromed type, with timbers decorated in scenes of the hunt. The floor is of terrazzo with brass stripping. The furniture for this room is of a simple design in keeping with its character.

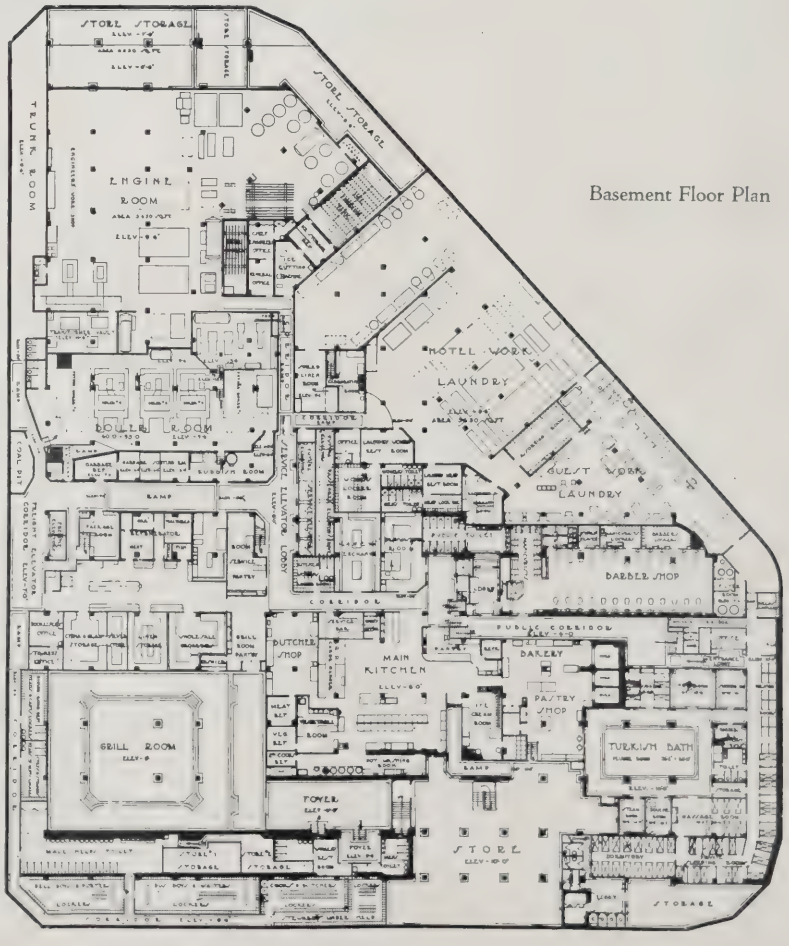
The main ballroom is entered through a large foyer, and as already said is two stories in height. The interior architecture and decoration are Spanish in character, with gold and subdued colors predominating. The ceiling is of the flat, vaulted type painted in a clouded sky effect. The floor for dancing is of oak with a broad border of terrazzo. The walls are finished in stippled and antiqued gold. There is a balcony around three sides of this room, with a large organ at one end. Additional features include a moving picture booth and an elevated floor at one end of the room which can be used as a stage.

A number of interesting rooms are arranged on the mezzanine floor. These include a series of private dining rooms, each of which has been given a special architectural effect. The second floor is given over entirely to service features and quarters.

The third floor is entirely devoted to sample rooms, as the Hotels Statler specialize in service to commercial travelers requiring space of

ple types of the period; in fact, there is a welcome restraint in the interior decoration which is at once practical and satisfying. The interior of the main dining room is also carried out in the style of the Italian renaissance period with a beamed and polychromed ceiling. The two raised ends of the room are separated by Cipolino marble columns. The walls are of artificial stone, with wainscoting and door and window trim of travertine. Here again the floor is of terrazzo and brass stripping.

An interesting feature of this room is the attractive dining terrace which is thrown open practically as a part of the room and similarly decorated. This dining terrace represents a successful use on the part of the architects of the 20-foot setback that establishes it as revenue-earning space. The ceiling of the dining terrace is of vaulted type and plastered finish. The furniture and decorations for these rooms are in keeping with the general scheme, and the orchestra is supplemented by a large organ. A dining room smaller than this, on the main floor, known as the men's cafe, has been carried out as an interesting adaptation of a Spanish interior. The walls are of oak paneling, while window and door trim



Basement Floor Plan

this type. General details of the planning of this floor are indicated in the accompanying plan, but an interesting note is the fact that each room is provided with a disappearing bed. This has been done to make possible the full use of the room for business purposes during the day, and to eliminate any suggestion of its use as a bedroom. In addition to the disappearing bed feature there is also a small dressing room. All floors from the 4th to the 16th inclusive contain the regulation guest rooms and are similar in plan. The arrangement of the upper part of the building in wings provides the maximum of light and ventilation for every room.

Bathrooms are grouped on the double stack interior plan, providing the double bath unit with pipe space between and accessible by opening the back of the built-in medicine closets. All the bathrooms are ventilated by a positive enforced system. The bedrooms are equipped with special doors of service type, built with receiving spaces so that deliveries may be made to guests from the outside without opening the inner section of the door, and without in any way disturbing the occupant of the room. Interiors of all guest rooms are of simple painted paneled walls with carpeted floors. The furnishing of the guest rooms is

Mezzanine Floor Plan

First Floor and Store Plans

that of usual hotel room of the better class.

The area of the lot has not been built on to the full height of the building, but plans are prepared for extension wings containing 500 more guest rooms. At the present time the hotel contains approximately 1,200 rooms, but in designing the service sections, public spaces and mechanical installations the building has been considered as a 1,600-room unit so that future extension has been cared for in a most practical manner. As evidenced by the plan of the 18th floor, it will be seen that the important element of elasticity has not been neglected in the planning of this building. This and the 17th floor are subdivided into reasonable office spaces, and will be carried as such unless requirements should make necessary their use for specific hotel purposes. The executive offices of the Statler organization are now located in this space.

From a structural viewpoint there have been no interesting deviations from ordinary practice, but it is interesting to note that the Statler organization carried out the construction work without a general contractor. The building is of the usual steel frame construction, with concrete floors. It is built on steel-cased, concrete piles approximately 45 feet in depth. The roof is of the ordinary flat deck type, and has no service or public space features except a wireless broadcasting station.

The kitchen and service section are quite

Library

clearly shown on the plan, but may require some explanation. The interesting feature of the layout is to be found on the main floor plan, where a large auxiliary kitchen is located adjoining the two dining rooms. In this kitchen most of the cooking for these dining rooms is done, and all service for these rooms is maintained. A larger kitchen is indicated on the basement floor plan. All room service, the cafeteria service and much of the preparation for the auxiliary kitchen are maintained directly from the basement kitchen.

Coal is delivered at sidewalk level into a receiving bin from which it is hoisted into a coal bin located over the boilers from which it drops to the stoker hoppers. Ashes are removed from a receiving bin provided with a clean-off valve above the sidewalk, and into trucks to be carted away. Steam is generated for heating and power purposes in three 500-h.p. boilers arranged with stokers with considerable overload to care for peak conditions. Use is made of low pressure, steam vacuum return system; there are some 3,000 radiators and a total of about 65,000 square feet of heating surface. A highly elaborate ventilating system has been provided for all underground rooms, and the ballroom, banqueting room and lobby are ventilated by means of air supply and exhaust. Interior bathrooms are exhausted by means of three

Main Dining Room, Hotel Statler, Buffalo
George B. Post & Sons, Architects

exhausters placed in the penthouse. All air ventilators are located in the main court in order to secure the best possible fresh air throughout the ventilating system.

The electrical equipment of the Hotel Statler consists of two services, one alternating current service, which is taken at 2,300 volts, 25 cycles, 3 phase and stepped down by transformers within the building, and also a direct current breakdown service for use in case of emergency. The feeders for both power and light are taken from the main switchboard in the engine room to the various power and lighting panels throughout the building. The power feeders are two-wire, 220-volt direct current; the lighting feeders are three-wire, 110–220-volt direct current. The distribution of lighting in the various guest rooms is laid out according to the usual Statler arrangement, with one switch center light and several base receptacles in each room. In each bedroom the bed, chiffonier and dressing table are supplied with base receptacles. All the elevators are the high speed 1 to 1 type, equipped with microleveling machines to bring the car platforms to the floor landings. All the laundry equipment and pumps are electrically driven.

The Hotel Statler Garage. Quite as complete and well planned as the hotel building proper is the garage, now under construc-

Stairway from Lobby

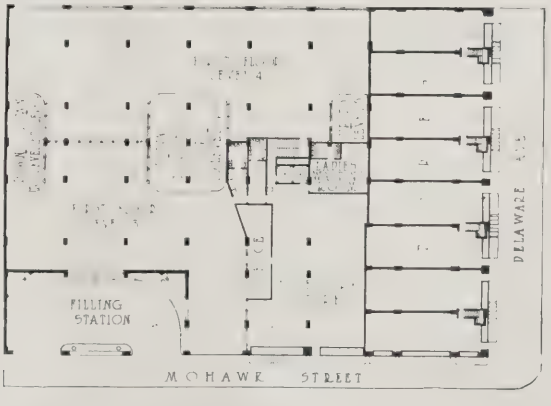
Grill Room, Hotel Statler, Buffalo
George B. Post & Sons, Architects

tion, intended for the hotel's service. It is opposite the hotel, with which it is in architectural agreement, and the ground floor of the frontage contains eight stores for rental. The garage entrance is upon a side street, and close by is an accessory shop and a gasolene filling station at which seven cars may be supplied at the same time.

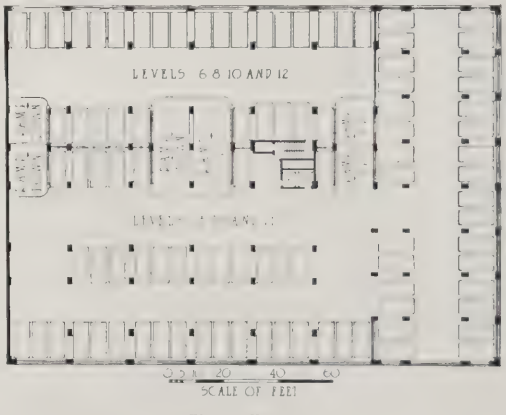
In laying out the plans for this building it was necessary that a dual problem be solved. It was important that the ramps be of sufficient capacity to handle several hundred cars per hour, since the traffic at certain times of the day will be extremely heavy, while at the same time the dictates of good business practice demanded that the greatest possible number of cars be accommodated. Examination of a typical floor plan will show that cars are arranged in lengthwise rows in the main section of the building, while at the end there are two crosswise rows. It will also be noted that one long row of cars faces on two aisles. This particular detail is due to the fact that the plot upon which the garage is built is of an odd size. Neither the 132-foot nor the 181-foot dimension is particularly satisfactory for a garage layout; some compromise was seen to be necessary, and after study of a number of possible plans it was found that the single row of cars facing an aisle front and rear offered the best solution.

The garage accommodates about 600 cars. It should be noted that the car spaces vary in sizes. The cars in the row at the Mohawk avenue side of a floor will be Fords or other small machines, while those at the Delaware avenue side will be larger. The remainder of the building is for cars of all sizes. The net frontage allowed per car is 7 feet in the main portion of the garage and 7½ feet at the Delaware avenue side; the depth allowed per car is from about 12 to about 15 feet, more than half being the larger size.

The width of the columns, measured along the aisles, was arbitrarily fixed at 18 inches, which considerably simplified the problem of securing an economical car layout; the depth of the column at right angles to the aisle was a matter of little importance, and the result is that some of the columns are 36 inches deep. It is thought that this method of limiting the column dimension *along* the aisle but placing no limit to the *depth* is new in garage design and worthy of close attention. Had circular columns been used, the actual reduction in car storage possible would have been about six cars to a floor, allowing for a net frontage of 7 feet to each. Entirely separate ramps are used for up and down traffic, and at no point does a car using the "up" path conflict with a car upon the "down."



First Floor Plan



Typical Floor Plan

Hotel Statler Garage, Buffalo
George B. Post & Sons, Architects

GENERAL VIEW FROM NIAGARA SQUARE

HOTEL STATLER, BUFFALO

GEORGE B. POST & SONS, ARCHITECTS

Photos by Schuyler Carteret Lee

EIGHTEENTH FLOOR PLAN

SAMPLE ROOM FLOOR PLAN

DETAIL OF NIAGARA SQUARE TERRACE

HOTEL STATLER, BUFFALO

GEORGE B. POST & SONS, ARCHITECTS

DETAIL OF ENTRANCE FRONT

DETAIL OF END BAY

HOTEL STATLER, BUFFALO

GEORGE B. POST & SONS, ARCHITECTS

VIEW ACROSS LOBBY FROM BALLROOM

HOTEL STATLER, BUFFALO

GEORGE B. POST & SONS, ARCHITECTS

INTERIOR OF DINING TERRACE

HOTEL STATLER, BUFFALO

GEORGE B. POST & SONS, ARCHITECTS

FIREPLACE END OF PRIVATE DINING ROOM

HOTEL STATLER, BUFFALO

GEORGE B. POST & SONS, ARCHITECTS

ENGINEERING DEPARTMENT

Charles A. Whittemore, *Associate Editor*

Wood as a Structural Material

By C. J. HOGUE, *Forest Products Engineer*

TIMBER framing is the most easily attainable form of construction and will probably be used as long as timber is available, yet it is taken largely as a matter of course and dealt with by "rule of thumb" methods.

Architects and engineers who are thoroughly informed as to the composition and methods of manufacture of steel and cement, and require that these materials be tested before use in their work, either have not used wood at all under analytical design or have designed structures of it without considering the underlying factors of its structural properties, have specified it with inadequate knowledge of classifications, and have accepted it on visual and not always expert inspection.

It is only within recent years that the Forest Products Laboratory of the United States Forest Service has undertaken research work in forest products on a scientific basis, and has analyzed the factors which should govern the selection of wood for engineering uses. Previously, test data came from miscellaneous sources; all the factors necessary for accurate deductions were not observed, nor were tests at different institutions made according to the same methods. Of late years, with dependable wood properties available and with a realization that incombustible materials are not fireproof, and that fire prevention and not fire resistance is true economy, many engineers are giving their attention to the technical development of the use of forest products until wood bids fair to take its place as one of the primary materials of construction and not as a secondary or assisting material that we have always at hand and can use without having to know much about it.

Relation of Weight to Strength

A fact of fundamental interest that the Forest Products Laboratory has developed is that there is a variation of less than 5 per cent in the density of wood substances or materials of which the cell walls are composed, whether of hardwoods or softwoods; that specific gravity, therefore, is a measure of the amount of wood substance contained in a unit volume of a given piece of wood, and that there are fairly definite mathematical relations between specific gravity and the various strength properties. Specific gravity, or dry weight, is a fairly good measure of the relative strengths of various species and a very good measure of relative strengths within a species. Some woods contain substances such as resin which are not of the wood substance and add weight without increasing strength.

The specific gravity of wood substance proper is about 1.55; if wood were solid it would weigh nearly 100 pounds per cubic foot. Its dry weight is therefore a measure of its air content, and its air content is a measure of its buoyancy, the length of continuance of which depends on its penetrability or the length of time within which the air content is replaced with water and the wood becomes heavier than water or "water logged."

Effect of Moisture Content

A second factor, which is of primary importance in comparing test data and relative strengths, is moisture content. Wood structure is much like a honeycomb, composed of hollow cells, the cell walls forming "party walls" between the open spaces.

When green, both cell walls and spaces between contain moisture. As the wood dries out, the moisture evaporates first from the open spaces of the cells and then from the cell walls. When the free water from the cells has evaporated and the cell walls are still fully saturated, the wood is said to be at the fiber saturation point. This, in the commonly used structural woods, is at a moisture content of approximately 25 per cent, moisture content being the percentage of moisture by weight of the dry weight of the wood, wood being considered "dry" when there is no further loss in weight in a temperature maintained at 212° Fahr. or 100° centigrade.

Below the fiber saturation point shrinkage begins, and as the cell walls dry out their strength increases. The increase in values in the mechanical properties of woods as they approach an air dry condition is quite material, the values of some properties almost doubling; the changes are in different proportions with various properties, however, and unit values for structural design should be based on properties of green wood, as in large timbers the increased values are often offset by the development of checks and other defects in seasoning, while at the same time in exposed positions timbers are likely to be alternately wet and dry, and so at times to have the mechanical properties of the extreme fibers reduced in strength to those of a green condition; it is, in fact, wise to use lower values in timbers in exposed positions for those properties which are subject to material change under varying conditions of mois-

ture, among which are tension and compression.

"Air dry" is an extremely indefinite condition, ranging from a moisture content of 5 or 6 per cent to fiber saturation; to be air dry is commonly understood to have a moisture content of from 10 to 15 per cent. Uniform drying is difficult to obtain, particularly in large timbers, and season checking will begin at the surface while the moisture content near the center is still far above the fiber saturation point, so that the determination of moisture content on an entire cross section is misleading and is dependable only when determined for various portions of the cross section. These two points, specific gravity and moisture content, should always be observed in any tests which are made, as otherwise they will not be logically comparable.

Rate of Shrinkage

Shrinkage would still cause checking in structural timbers if uniform drying were obtained, because of the difference in rate of shrinkage in radial and circumferential or tangential directions. The radial shrinkage in various species of the woods commonly used for structural purposes is from 3 to 5 per cent, while the tangential shrinkage is from 6 to 8 per cent; the radial shrinkage in any particular species being, however, approximately 60 per cent of the tangential shrinkage; the resultant shrinkage in volume is 10 to 12 per cent.

Shrinkage to an air dry condition would, of course, be materially less than these percentages, and thin boards or planks are usually so predominantly of vertical or flat grain as to largely avoid shrinkage checks, although the shrinkage of a board or plank in which the grain is nearly vertical, that is, at a right angle to the wide face, would still be approximately 60 per cent of that of a board or plank in which the grain was nearly flat, or parallel with the wide face.

Wood Structure

Wood is made up of cells, the arrangement of which appears, under a microscope, to be similar to a honeycomb, although the wood cells are very small. Trees are commonly divided into hardwood and conifer groups; in general the hardwoods have broad leaves and the conifers needlelike leaves; the hardwoods are deciduous and the conifers are evergreen; the hardwoods are porous and the conifers are non-porous; the conifers are often known as softwoods, although some conifers are harder than some hardwoods. The cells are, comparatively, long and slender and enclosed at both ends. The hardwoods are composed of cells or wood fibers and larger pores, the conifers of cells which in general are larger than the cells of the hardwoods and smaller than the pores. The conifers are the principal structural woods, hardwoods being seldom used now for that purpose. The cells of the conifers are approximately 1/12 of an inch long and 1/1000 of an inch in diameter. This applies to practically all the conifers.

Each year a new layer of wood or annual "ring" is added to the circumference of a tree. The cells divide in a direction radial from the center of the tree, and from each cell a new one is formed during the annual period of growth, thus forming the width of the annual ring. The cells or fibers are therefore arranged in definite radial rows, the cells in each row being of practically the same length vertically, and the pointed ends of the vertical radial rows interlocking.

In "plan" the cells in adjacent radial rows "break joints" with each other, and vertically the radial rows do the same, the interlocked ends of two adjacent vertical rows coming at any point in the length of the adjoining vertical rows. In the conifers the cells first formed each year are nearly square, and the cell walls are very thin compared to the diameter of the cells; in the latter part of the growing season the tangential diameter of the cells remains about the same, but the radial diameter becomes much less and the thickness of the cell walls increases materially. The earlier, lighter growth is called "springwood," while the later, heavier growth is called "summerwood." The change from spring growth to summer growth is quite abrupt, and the contrast is usually quite marked, the summerwood being darker because of its density.

Sapwood and Heartwood

In the cross section of a tree a certain number of annual rings nearer the bark are lighter in color than those nearer the pith and are called "sapwood," the inner, darker rings being called "heartwood," the sap rising through the sapwood while it has ceased to rise through the heartwood. The controlling factors which cause sapwood to become heartwood are not definitely known, the same annual ring sometimes being sapwood in one part of a tree and heartwood in another. In some species there is a decided difference in color between heartwood and sapwood, while in others there is little difference. The color of the heartwood is due to the deposit of gums and other coloring matter, the exact nature of which is not yet known. In some species the sap ring is very narrow, while in others it is very wide; in Douglas fir it is approximately 2 inches wide in a 48-inch tree, while in a pine it may extend nearly halfway to the pith or center of the tree.

Sapwood is equally as strong as heartwood, but is much less resistant to decay. Sapwood is frequently discolored with sap stain, but this does not weaken it and is not decay. As the strength of sapwood is frequently questioned, so is the strength of "fire killed" timber. Fire killed timber is, however, as strong as living timber, unless infected with decay, as all heartwood is essentially "dead" wood, the life of the tree being entirely in the sapwood.

Strength Factors

What is known as "strength" properly includes all the mechanical properties of wood which bear on its structural utility. Different kinds of strength vary relatively in different species; a wood which

is stronger in one property than that of another species may be weaker in other properties. Pine is stronger in tension and compression than a hardwood like oak or maple, but oak or maple is tougher in shock-resisting utility and harder as expressed in resistance to wear.

Wood is quite variable as compared with other structural materials. If wood were not subject to inherent physical defects, like knots and twisted grain, nor to acquired mechanical defects, such as seasoning checks, shakes, etc., it could be used at unit values far higher than working unit stresses now advised. To use wood intelligently, therefore, it is necessary to consider the influence of physical properties and defects on strength values.

The Forest Products Laboratory has established five points which should be considered in the selection of structural timbers and values for them. They are: rate of growth; proportion of summerwood; size and position of knots; amount of shakes and checks, and angle of grain.

Rate of Growth. This refers to the width of the annual rings and is measured by the number of rings per inch. Rate of growth has no definite nor absolute relation to strength, although conifers of extremely rapid or exceptionally slow growth are likely to be brittle and below the average in strength. Six rings to the inch has been established as the minimum number of annual rings or maximum rate of growth, while pieces of such slow growth or of so many rings to the inch that the proportion of summerwood is not easily discernible should also be excluded.

Percentage of Summerwood. Proportion of summerwood is a very good measure of relative strength, particularly within a species. It is really a visual method of estimating specific gravity, there being quite a definite relation between strength, specific gravity and percentage of summerwood. It has been found that, other properties being satisfactory, a proportion of one-third summerwood will, in the southern pines and Douglas fir, give average ultimate strength with good factors of safety on commercially used unit stresses. Pieces with less than six rings per inch are acceptable when they have at least one-half summerwood.

Summerwood is a better criterion of strength in some species than in others, and in some the distinction is more definite than in others. In the butt logs of southern pine the rate of growth and percentage of summerwood are quite uniform, from an inch or two from the pith to quite well into the sapwood. In Douglas fir and upper cuts of southern pine the rate of growth is rapid near the pith and decreases quite uniformly toward the bark. In Douglas fir the percentage of summerwood increases for about 12 inches from the pith, after which it again decreases.

For these reasons rate of growth and percentage of summerwood in southern pines, for an average over 3 inches, may be measured over the third, fourth and fifth inches from the pith or center of the tree, while in Douglas fir the 3 inches should be located at a distance from the pith depending on the smallest dimension of the timber, the rule established by the Forest Products Laboratory being that the outside of the second inch shall be at a distance from the pith equal to half the smallest dimension of the timber. This somewhat complicated location of the 3 inches was the result of the determination of a rule which would pass the greatest proportion of timbers having a certain minimum strength value.

Specific gravity of dry wood substance is a better measure of strength than proportion of summerwood, but is difficult of ready determination, and in southern pines is often complicated by resin content which may be as high as 3 or 4 per cent and which adds weight without increasing strength. The change from springwood to summerwood is more abrupt in southern pines than in Douglas fir, and is a fairer measure of strength, there being a considerable strength value in the springwood of Douglas fir which is not taken into account when the proportion of summerwood is determined; this is somewhat compensated for, however, by the fact that with increase in proportion of summerwood there is a decrease in density, that is, the specific gravity does not increase as fast as the percentage of summerwood, so that on the whole summerwood rather underestimates than overestimates the relative strength of Douglas fir.

Douglas fir is the largest future source of structural timber, forming nearly one-fourth of the standing timber in the United States, and is an exceptionally strong wood for its weight. It has been shown that the strength of various species is largely proportional to their dry weight; Douglas fir is about 20 per cent lighter in weight than the southern pines and has proportional strength in toughness and shear, but in tension, compression and stiffness has equal values at the lighter weight.

Knots. The effect of knots on a timber depends on their character and locations. Sound and tight knots are, as a rule, harder than the surrounding wood fibers and do not weaken a beam in compression unless they so disturb the direction of grain as to cause it to be at a decided angle to the direction of stress. Knots do not seem to weaken a timber in shear, but rather tend to have the effect of pins in preventing the fibers from sliding on each other. Loose or unsound knots, except of very small size, should of course be avoided, and so should knots which break the continuity of fibers near the bottom and center of a beam; the latter are the knot defects which should be looked to most carefully.

Shakes and Checks decrease the shearing strength of beams; they are usually found near the ends where, if they are near mid-depth of the beam, they affect it most in shearing strength. There is, however, somewhat of a relation between shakes in green timber and checks in seasoned, shakes apparently acting as a sort of safety valve for seasoning checks, and so if shakes around the pith of the tim-

ber are limited to one-quarter the width of the piece in green timber or one-third the width in seasoned, or any combinations of shakes and checks are limited to these proportions, the ultimate checking will presumably not exceed the amount allowed for in determining recommended unit stresses.

Angle of Grain. Diagonal grain, due to cutting timbers across the grain, or spiral grain, due to twisting of a tree while growing, should not be permitted when the slope of the grain is more than 1 in 20; this is particularly important at the bottom of a beam near the center, where the greatest tension stresses occur.

Recommended Values

The working unit stresses for southern pines recommended by the Forest Products Laboratory are based on all five of the factors just described, with a note that Douglas fir, when the same factors are considered, shall have the same unit stresses except in shear. Other values given for Douglas fir and values given for all other woods are based on the restrictions on knots, shakes and checks and angle of grain, but not on summerwood or rate of growth requirements, although it is noted that pieces of very light weight should be excluded.

Decay

After suitability for use is determined, there are other facts which should be considered having to do with continuance of usefulness. One of them is resistance to decay, which is dependent on many factors. Decay is always the result of fungous growth, a low form of plant life, different varieties requiring varying proportions of light, air and moisture. Some kinds of fungous spores enter through injuries to a living tree, some of these progressing while the tree lives and dying when the tree is killed or felled, these kinds of fungi seldom causing continuing damage in timber after it is cut; others of the fungi enter the tree and remain dormant until the tree dies or is felled, when they become active. The air is constantly full of fungous spores ready to attach themselves to wood substances and to become active under favorable conditions.

Proper ventilation and opportunity to dry out are the greatest preventions. Practically all fungi to which structural timbers are subject are killed by not very high temperatures; a structure which can be heated to somewhat over 100° Fahr. once or twice a year will practically never be subject to decay, while incipient decay can usually be arrested by such means.

Resistance of various woods to decay is dependent somewhat on relative penetrability, and in more resistant woods, such as cypress, cedar and redwood, to certain agents or oils which are toxic to fungous spores. Sapwood is much less resistant to decay than heartwood because of its heavy moisture content, possibly also because of its immaturity and of the fact that gums, resins and other oils which may be more or less toxic or resistant to decay have not yet been deposited. Sapwood, although equally as strong as heartwood, should not be used in wet or exposed locations unless given a preservative treatment.

Preservation

Preservative treatment by injection of creosote or other toxic matter, or by dipping or brush treatment, is well worth the expense for many uses. Full pressure treatment, roughly speaking, doubles the cost and trebles the life. Brush or dipped treatment costs, of course, much less and is not as effective. Treatment as resistive to insects is usually imperative in salt water, where the life of untreated timber is frequently as short as from six months to two years, while treated timber will last until no longer useful, from obsolescence of the structure or other causes. The resistance of creosote to decay is toxic, to insects is due to the taste.

Ease of treatment varies with species. The southern pines are easily treated without loss of strength by ordinary pressure methods. Douglas fir is less penetrable than the pines and is harder to treat, although a method of seasoning in oil boiled under a vacuum in order that treatment may take place at a temperature below that which is injurious bids fair to provide a method of treatment without loss of strength. Seasoned wood is treated much more easily than green, and sapwood of any species is more easily treated than the heartwood.

Fire Resistance

Wood burns, but much less easily and with much less damage than is commonly thought. Steel and concrete are incombustible, but unprotected steel becomes plastic at a temperature about two-thirds that of the average fire; cast iron is more resistant, but still becomes plastic within or at about a conflagration temperature. Cement begins to de-hydrate at from one-third to one-half the temperature of an average fire, and the effect of fire on concrete and wood is very similar. De-hydration and charring progress at practically the same rate, the progress becoming increasingly slow as the calcined concrete and charred wood insulate the inner material; concrete is liable, however, to extensive damage if cold water is suddenly thrown on it.

Wood in small sections or on sharp edges is easily inflammable; that is why edges of beams or columns should be chamfered. Wood in masses and large areas is, on the other hand, very resistant to combustion. The chief damage to wood structures in fire is due to the iron column cap or joist hanger, and an investigation is now under way to develop such connections, or to so insulate them or the wood from them as to remove this handicap. Materials of construction may be incombustible but not fireproof; they are at best only fire resistant, and all, to prevent fire damage, should be insulated. Progress is being made in fire resistive treatment of wood, which will materially increase its fire resistance at comparatively little expense.

Analysis of "Two-Way" Flat Slabs

By E. F. ROCKWOOD, *M. Am. Soc. C. E.*

FLOOR slabs of reinforced concrete supported upon columns without beams or girders and extending two or more bays in each direction are commonly known as flat slabs. The columns may be, and usually are, provided with enlarged heads. In addition, the slab may be thickened on the under side in the vicinity of the columns, forming what is known as a "drop" or a "depression."

The sketches given here show the cracks that developed in four test panels of a flat slab floor in a building built in Chicago in 1921. These cracks indicate the regions of high tensile stress where reinforcing steel is needed. Such reinforcing steel can be at right angles to the cracks, taking the stresses directly, or by crossing the cracks at an angle can take components of these stresses. The writer knows of

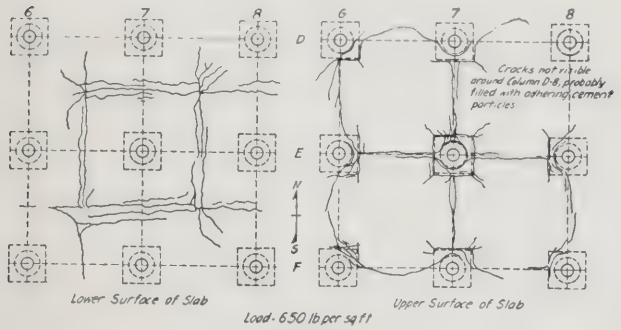


Fig. 1

three common systems of arranging such reinforcement,—the two-way system, the four-way system, and the S. M. I. system. The latter requires less steel than either of the others, but the steel in it is more complicated to design, bend and place, and if the system is used a royalty must be paid. The other two systems require approximately equal amounts of steel, but the two-way system is simpler to place and has only two layers of steel over the column heads, which allows the concrete to be more readily placed. The writer therefore favors the two-way system. In this system all the rods run parallel with the column lines in two directions, and where they do not cross a crack line at right angles the stress causing that crack is carried by components of two rods at right angles to each other.

Many theories have been advanced for the design of flat slabs, and engineers do not agree upon any one of these, but tests on floors that have been built furnish sufficient data for arbitrary methods of design, and one of the best of them is described by these specifications and is illustrated in Figs. 2 and 3.

Capital. Columns shall be provided with enlarged capitals, and the diameter (c) of this capital shall be the base diameter of the largest right circular cone which lies entirely within the column (including the capital) whose vertex angle is 90° and whose base is 2½" below the bottom of the slab or the bottom of the dropped panel. The diameter of the capital shall not be less than ⅕ the distance center to center of the columns, and shall be such that the unit stresses specified elsewhere are not exceeded.

Brackets. Brackets or haunches shall be provided on exterior columns when necessary to transmit the shear and bending from the slab to the column.

Interior columns. The smallest dimension of interior concrete columns supporting flat slabs shall be not less than 1/15 the span, center to center, of columns in the longer direction.

Dropped panel. A thickening of the slab on the under side in the vicinity of the columns is termed a dropped panel. Its width in any direction shall not be less than ⅓ the panel's length in that direction, and its thickening shall not be greater than 1.5 times the slab thickness.

Thickness of flat slabs and dropped panels. The minimum thickness of floor slabs shall not be less than 1/32 and of roof slabs 1/40 of the distance center to center of columns in the longer direction. The thickness shall be such as to withstand the shear around the column capital or around the dropped panel.

Shear. Shearing Stress. The shearing unit shearing stress shall not exceed the value of "v" in the formula,

$$v = 0.02f'_c\ (1 + r)$$

nor in any case shall it exceed 0.03 f'_c (f'_c = ultimate compressive strength of the concrete at 28 days).

The unit shearing stress shall be computed on:

(a) A vertical section which has a depth, in inches, of $\frac{7}{8}(t_1 - 1\frac{1}{2})$, and which lies at a distance, in inches, of $t_1 - 1\frac{1}{2}$ from the edge of the column capital; and

(b) A vertical section which has a depth, in inches, of $\frac{7}{8}(t_2 - 1\frac{1}{2})$, and which lies at a distance, in inches, of $t_2 - 1\frac{1}{2}$ from the edge of the dropped panel.

In no case shall "r" be less than 0.25. Where the shearing stress on section (a) is being considered, "r" shall be taken as the proportional amount of reinforcement crossing the column capital; where the shearing stress at section (b) is being considered, "r" shall be taken as the proportional amount of reinforcement crossing entirely over the dropped panel. (For typical flat slab and designation of principal design sections, see Figs. 2 and 3.)

Moments. In an interior panel the bending shall be taken thus:

(a) Negative moment in middle strip: Extending in a rectangular direction from a point on the edge of panel $\frac{l_1}{4}$ from column center a distance $\frac{l_1}{2}$ toward the center of adjacent column on the same panel edge.

(b) The maximum negative moment and the maximum positive moments in the middle strip and the sum of the maximum positive moments in the two column strips may each be greater or less than the values given in the table herewith by not more than $0.01M_o$.

Moments for Slabs with Two-Way Reinforcement

Strip	Flat Slabs without Dropped Panels		Flat Slabs with Dropped Panels	
	Negative	Positive	Negative	Positive
Column strip.....	0.25 M_o	0.11 M_o	0.25 M_o	0.10 M_o
Two-column strips....	0.46 M_o	0.22 M_o	0.50 M_o	0.20 M_o
Middle strip.....	0.16 M_o	0.16 M_o	0.15 M_o	0.15 M_o

In flat slabs in which the ratio of reinforcement for negative moment in the column strip is not greater than 0.01, the numerical sum of the positive and negative moments in the direction of either side of the panel shall be taken as not less than:

$$M_o = 0.09\ Wl\ (1 - 2/3\ \frac{c}{l})^2$$

Where M_o = sum of positive and negative bending moments in either rectangular direction at the principal design sections of a panel of a flat slab;

c = base diameter of the largest right circular cone which lies entirely within the column (including the capital) whose vertex angle is 90° and whose base is 1½" below the bottom of the slab or the bottom of the dropped panel. (See Fig. 2.)

l = span length of flat slab, center to center of columns in the rectangular direction, in which moments are considered; and

W = total dead and live load uniformly distributed over a single panel area.

Wall and other irregular panels. In wall panels and other panels in which the slab is discontinuous at the edge of panel, the maximum negative moment one panel length away from discontinuous edge and maximum positive moment between shall be taken thus:

(a) Column strip perpendicular to the wall or discontinuous edge. 15% greater than that given in table.

(b) Middle strip perpendicular to wall or discontinuous edge, 30% greater than that given in table.

In these strips the bars used for positive moments perpendicular to the discontinuous edge shall extend to the exterior edge of the panel at which the slab is discontinuous.

Panels with wall beams. In panels having a marginal beam on one edge, or on each of two adjacent edges, the beam shall be designed to carry the load superimposed directly upon it. If the beam has a depth greater than the thickness of the dropped panel into which it frames, the beam shall be designed to carry, in addition to the load superimposed upon it, at least one-quarter of the distributed load for which the adjacent panel or panels are designed, and each column strip adjacent to the parallel with the beam shall be designed to resist a moment at least one-half as great as that specified in the table for a column strip. If the beam used has a depth less than the thickness of the dropped panel into which it frames, each column strip adjacent to and parallel with the beam shall be designed to resist the moments specified in the table for a column strip. Where there are beams on two opposite edges of the panel, the slab and the beam shall be designed as though all the load were carried to the beam.

Flat slabs on bearing walls. Where there is a beam or a bearing wall on the center line of columns in the interior portion of a continuous flat slab, the negative moment at the beam or wall line in the middle strip perpendicular to the beam or wall shall be taken as 30% greater than the moment specified

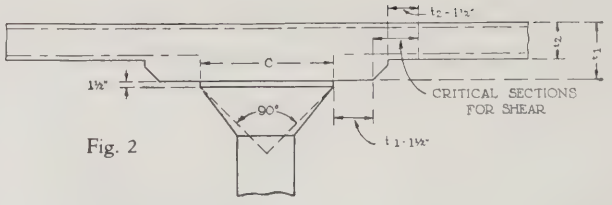


Fig. 2

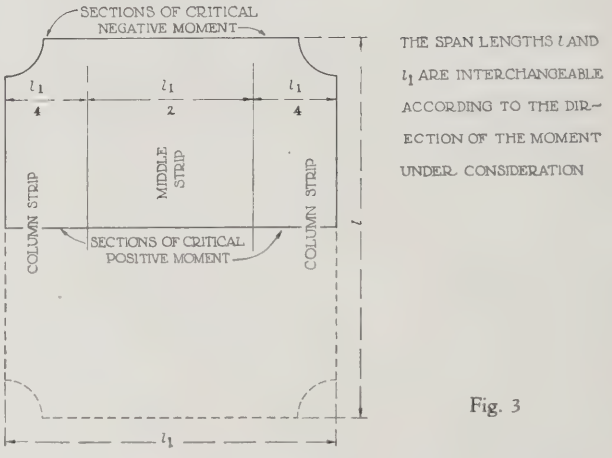


Fig. 3

in the table for a middle strip. The column strip adjacent to and lying on either side of the beam or wall shall be designed to resist a moment at least one-half of that specified for a column strip.

Point of inflection. The point of inflection in any line parallel to a panel edge in interior panels of symmetrical slabs without dropped panels shall be assumed to be at a distance from the center of the span equal to 3/10 of the distance between the two sections of critical negative moment at opposite ends of the line; for slabs having dropped panels, the coefficient shall be ¼.

Arrangement of reinforcement. The design shall include adequate provision for securing the reinforcement in place so as to take not only the critical moments, but also the moments at intermediate sections. At least two-thirds of all bars in each direction shall be of such length and shall be so placed as to provide reinforcement at two sections of critical negative moment and at the intermediate section of critical positive moment. Continuous bars shall not all be bent up at the same point of their length, but the zone in which this bending occurs shall extend on each side of the assumed point of inflection, and shall cover a width of at least 1/15 of the panel length. Mere sagging of the bars shall not be permitted. In four-way reinforcement the position of the bars in both diagonal and rectangular directions may be considered in determining the width of zone of bending.

In general the negative bending moment for a panel width along a section at and parallel to the wall columns shall be taken as 5/16 M_o. The bending in the exterior columns shall be taken as 5/16 M_o. $\frac{Wh}{4}$ where "h" is the thickness of exterior column.

This method follows very closely that used in the latest report of the "Joint Committee" and the Chicago Ordinance, as it is practically a combination of both.

ITALIAN RENAISSANCE DETAILS

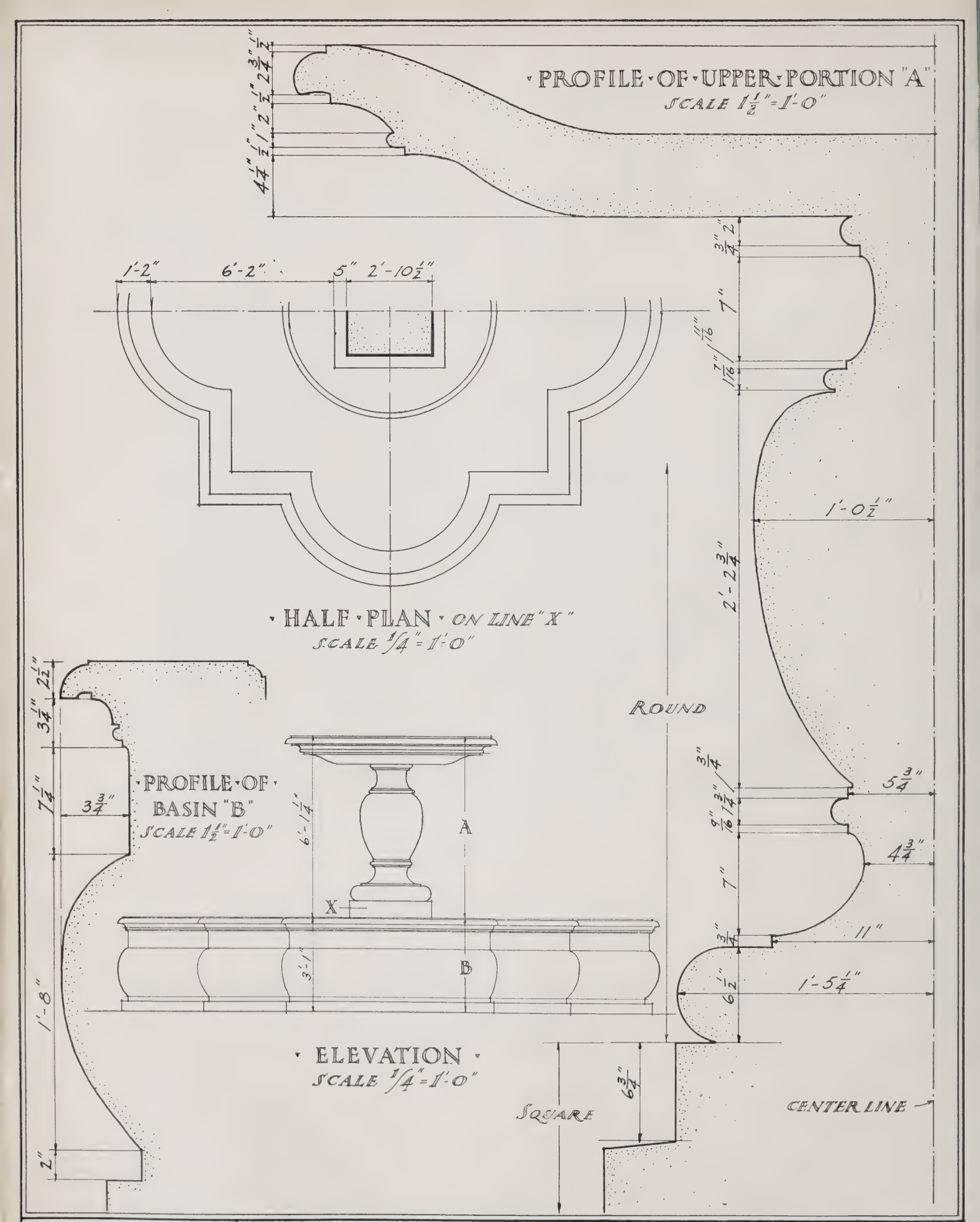
A SERIES OF MEASURED DRAWINGS

By J. HUNTER McDONNELL

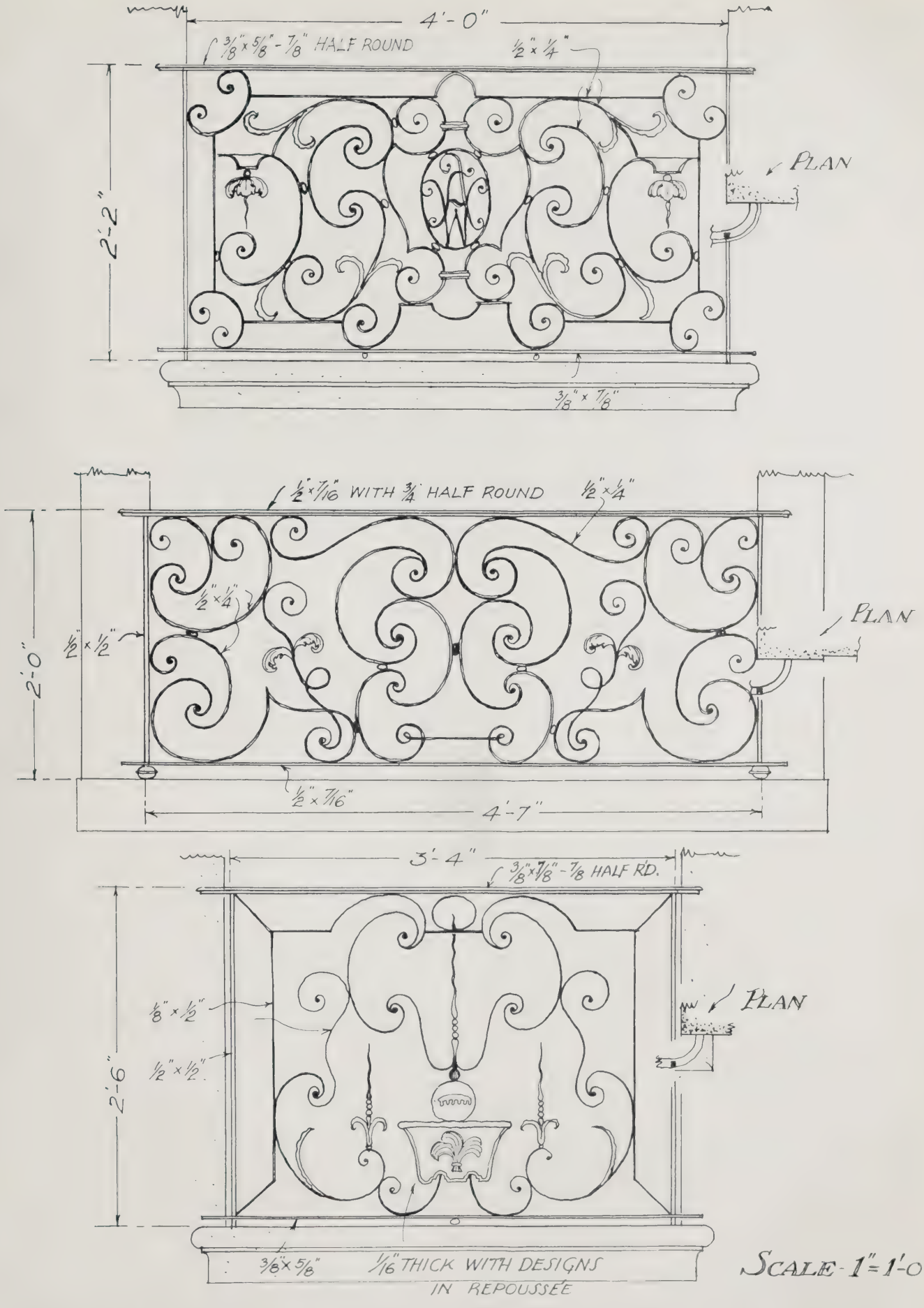
FOUNTAIN IN PIAZETTA DELLA ZECCA, THE VATICAN, ROME

THE Vatican, with its bewildering number of rooms, its halls and loggias, contains a great variety of courtyards, large and small. The Piazetta della Zecca (mint) is one of the minor courtyards, and is partially surrounded by the building which until the fall of the temporal power in 1870 was used as the pontifical mint.

At the center of the piazetta stands this fountain which is an excellent example of the type which one frequently sees throughout Italy in public squares or in the courtyards of buildings sufficiently large for fountains of fairly robust scale. This fountain is particularly suitable for use in modern reproduction, since its simplicity of form and lack of intricate ornament render it easily cast in concrete. For its beauty and interest the fountain depends entirely upon its bold and vigorous lines and the skillful use of mouldings about the basin and the upper portion. If cast in concrete, the fountain might be given added variety by the use of different finishes for certain of these heavier mouldings.



ITALIAN RENAISSANCE DETAILS	FOVNTAIN IN PIAZETTA DELLA ZECCA VATICAN ROME	MEASVRED & DRAWN BY HVNTER McDONNELL



FRENCH DETAILS 1923	WROUGHT IRON BALCONIES TOURS, FRANCE	MEASURED AND DRAWN BY F. N. BREED.

FRENCH RENAISSANCE DETAILS

A SERIES OF MEASURED DRAWINGS

By F. NELSON BREED

WROUGHT IRON LUNETTE, TOURS, FRANCE

THE lesser cities of France are veritable museums of excellent ironwork which appears in railings about balconies, as guards at windows, and often as lunettes above doors or gateways. The lunette illustrated upon this page is from the Academy of Music at Tours. Like much old French wrought iron it is of a simple Louis XV type which would be appropriate for use in modern buildings of many kinds. The variety of its forms gives this old French work a quality not always found in English or colonial ironwork, and its flowing, luxuriant design gives it a value in affording necessary contrast to large expanses of wall surface or to compositions in which much use is made of straight lines. Particularly in railings or window guards, such ironwork often includes initials.

Scale: three-quarters inch equals one foot

BUSINESS & FINANCE

C. Stanley Taylor, *Editor*

Prosperity or Collapse in the Building Industry?

THERE can be no doubt that the most absorbing topic in the building industry today relates to the reaction of the public during the remainder of this year and through the year 1924. Again, as in 1920, the building public is becoming acutely alive to a situation of cost increase which tends to make building construction prohibitive in price, consequently threatening the sudden collapse of the recently developed building boom. While definite prediction in regard to this matter is impossible, it is of great interest to examine the contributing influences which tended to create the present indeterminate situation and, insofar as possible, to forecast the trend of public demand for buildings. This can be done only through an unbiased examination of cause and effect and a logical determination of those steps which may be taken to prevent any panic condition which might result in a sudden collapse of present activity.

Architects, particularly, find themselves in a difficult position today in relation to the advice which they should give their clients. Should new projects be withdrawn from the market now? What is the present cost situation? Have we reached the peak, and will costs become stabilized, or will there be an immediate downward trend? These are some of the questions which clients are asking.

In December, 1922, as a result of a comprehensive survey among architects, THE ARCHITECTURAL FORUM predicted a greater volume of building activity for 1923 than the record-breaking volume of 1922. This prediction of an increase, which approximated 20 per cent over the volume of 1922, was based on a large number of confidential reports rendered by architects, and thus far this prediction has been more than substantiated by the actual figures of the first five months of this year. By turning to the chart on the first page of the Service Section in this issue (page 65) it will be seen that the volume of actual and anticipated construction during the first months of 1923 has considerably exceeded that of 1922. While this condition represents a great period of prosperity in the building industry and great activity in the offices of architects, there remains the question whether this activity will be shortlived or possibly extend in diminishing force over a considerable period of time.

The Present Building Cost Situation

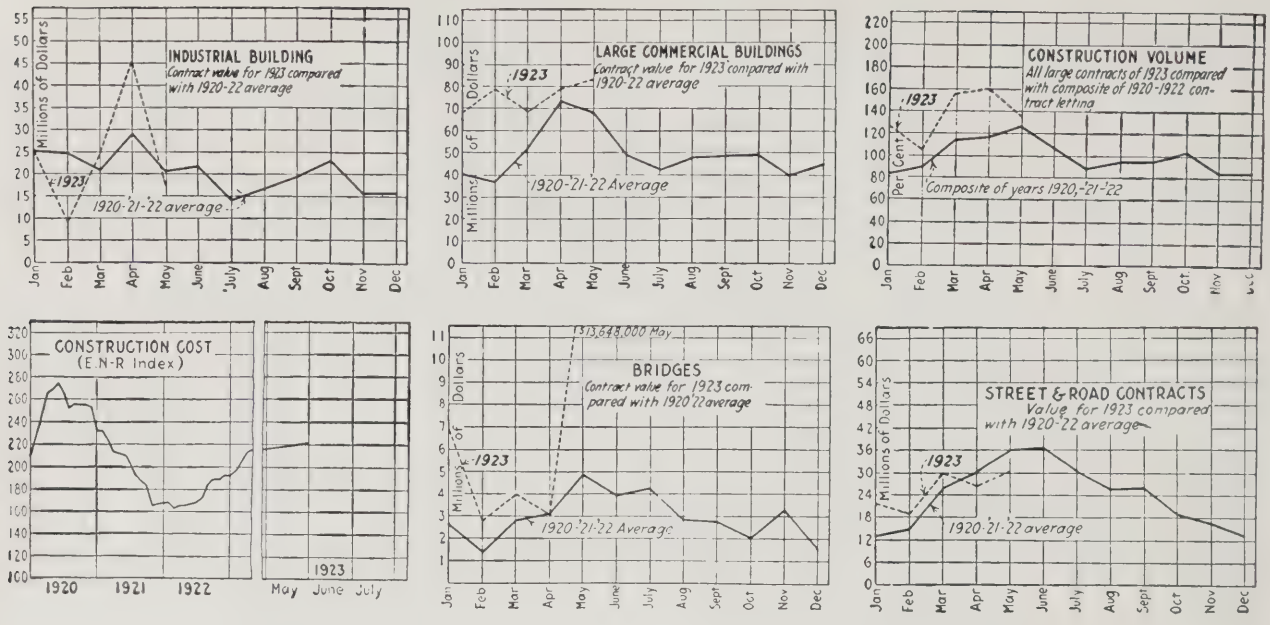
While a certain proportion of this unusual demand for building materials and labor had been anticipated, there is no doubt that the pressure of demand has created a "seller's market" in which to a great extent the buyer has been setting prices at higher levels on a basis of high bidding for quick deliveries. As a result of the activity of last year it has been generally true that stocks of construction materials on hand have been lower than last year under conditions of greater demand. Demand has also produced a similar effect on labor, both in cost and production, so that the anticipated sharp rise in building costs has taken place as indicated in the chart referred to, in these paragraphs, and in one smaller chart shown herewith. In regard to actual building costs today, there is such a wide variation in reports on all types of recently completed buildings that without a thorough analysis of a large number of such reports no fair indices can be established. It is but natural that the unbalanced condition of increasing cost and increasing demand could not continue on a permanent basis.

Recently, certain contributing factors have appeared which are tending to check further increases in price and to cause a temporary stabilization. Among these factors may be noted a definite falling off in the volume of speculative building; failure of mortgage loan appraisals to keep pace with building cost increases; the proof that in many instances materials were over-ordered, and finally, the withdrawal of many projects from the market. In addition to these conditions there is a normal seasonal influence to be taken into consideration, and it is anticipated that the index of building cost will not continue upward but will assume a gradually declining course as unfilled orders are made up and as stimulated production creates a better condition of balance between supply and demand.

Handling the "Buyers' Strike"

In many branches of the building industry a natural fear has been expressed that these conditions would develop what we term a "buyers' strike," in which a large proportion of potential building investments would be frightened out of the market. There is no question of the existence of this element of danger, and that logical steps should be taken to ease the situation. It is obviously true, however, that any concerted effort to control or influence this public demand has in it a number of dangerous elements and should be handled with the greatest care.

Recently, in New York, a group of architects, contractors and producers of building materials



These charts record the volume of construction values of 1923 compared with 1920-1922, and changing costs

have presented through the public press and other publicity channels considerable information of unquestionable value to the building public. The gist of this advisory information has been to cause the public to control its demand while prices are at present high levels. Similar efforts of control demand will undoubtedly be made in many sections of the country. While it is true that some remedy is required by the situation, it is highly important that the dangers of establishing a public consciousness of the folly of building now be clearly recognized. It took several years for the investing public to return to the building field as a logical outlet for its money. It took a long, sharp drop in costs to bring about the building boom which we are now enjoying. To a certain extent the prosperity in the country is today resting on the building industry, as will be explained in a later section of this article. It would, therefore, seem that instead of general advice toward the curtailing of building operations, this advice should be selective in its nature and should tend to indicate the types of buildings which should be deferred with logical reasons for such action by the investor.

From the viewpoint of the individual architect, it would seem to be his duty to clients to admit the wisdom of deferring public buildings and other structures of non-investment or speculative type; to recommend the immediate construction of investment and service buildings, since at present costs the investment is sound in character or else the abnormal cost may be quickly written off by unusual returns from the building, and to do all in his power to discourage that type of purely speculative building which indicates a certain mortgage foreclosure within a brief period of years.

Already there are signs of a curtailment of mortgage funds, and it will be unfortunate indeed if the financing of building operations (at best a difficult problem) should receive a discouraging setback at this time. In the process of a natural reaction to high costs it is quite probable that many projects will be deferred, if not abandoned, and this operation of the law of supply and demand will probably in itself show a sufficient decrease to relieve the present overstrained situation. If this is true, as it always has been true in the past, then is it not possible that any artificial restraint which may be imposed will have a tendency toward such discouragement on the part of building investors that a period of absolute stagnation may be facing our industry?

The Long Period of Prosperity

In order that a fairly clear picture of recent conditions in the construction industry may be established in the minds of readers, there are presented herewith a number of small graphic charts prepared by *Engineering News-Record* and indicating construction activities in 1922 and 1923 in the form of contracts awarded, first, in the United States, and second, in six divisions of the country. In addition to these charts others are presented which show the general division of construction contracts in 1923 as compared with the average of the preceding three years. These divisions cover all construction contracts: bridges; street and road contracts; industrial buildings and large commercial buildings. On the second page of the Service Section in this issue will be found a chart showing a general division by volume and by investment of contracts let in the building field. With this information in mind we may turn to certain comparative conditions in the general business field as recently expressed by George Woodruff, Vice-president of the National Bank of the Republic (Chicago), in which he cites relative conditions and gives an expression of opinion as to prosperity and the building trades. He says:

It was not so very long ago that the business men of our country were looking forward to an improvement from de-

pressed business conditions, and were basing their hopes for an era of prosperity upon three factors:

First,—The building up of surplus bank reserves which would make possible a large extension of credit for financing a greatly increased volume of business.

Second,—The development of a domestic trade boom due to increased buying power that would follow the lowering of the retail cost of manufactured goods and the raising of the prices obtained by grain growers, and due also to the general need for houses, roads, railroad repairs, and various types of goods and supplies, resulting from curtailment during the war years.

Third,—An increased foreign trade activity following such a settlement of European political and social problems as would make possible the sale of foreign securities in America, the proceeds of which could be used to pay for European purchases in this country.

At the present time the prosperity that our business men had been looking for is actually in full swing, but this prosperity did not develop just as had been expected. First, it is, of course, true that we have experienced a great increase in surplus bank reserves and that ample credit is available for the financing of our business activities. Second, it is also true that a domestic trade boom has developed, but the basis of this boom has not been entirely sound, because the liquidation of manufacturing costs was cut short during 1922, while the prices obtained by grain growers did not materially improve, the consequence being that the purchasing power of the large agricultural classes has been decreasing instead of increasing, and our domestic trade activity has consequently been temporarily supported almost entirely by the filling of the urgent needs resulting from the curtailment during the war. Third, our present prosperity does not enjoy that degree of permanency that would come from an increasing foreign trade, for Europe has not been able to sell securities in America in large volume, and the people across the water have therefore not yet been able to buy of us the machinery, supplies and raw materials that they need in order to make up for the shortages of recent years.

In view of the somewhat unsound basis of our present prosperity, many people are asking how long this prosperity will last, and in this connection it is interesting for us to note, first of all, that our very satisfactory credit situation shows no signs of weakening for some time to come. This is well illustrated by the chart showing the surplus reserves of the Federal Reserve System.

Next we must give consideration to the fact that many of our pressing needs due to war curtailment have now about been filled, and that *the great activity of the building industry now remains as the one most important factor in prolonging our present lively domestic trade.*

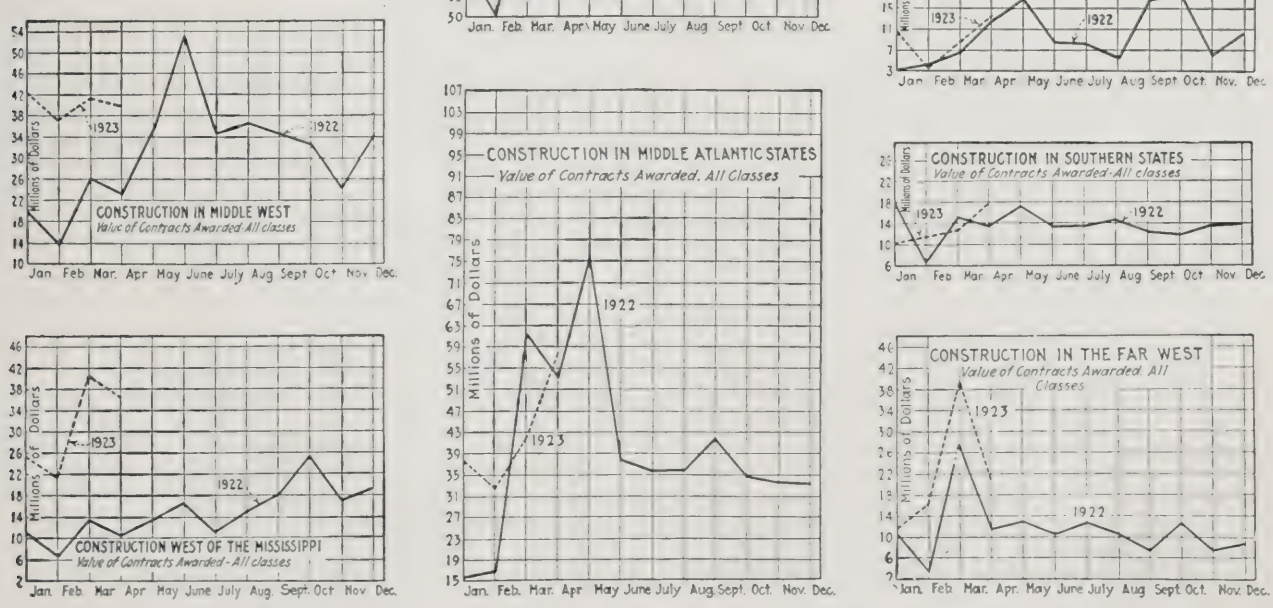
The purchases of our agricultural classes usually form the backbone of any great domestic activity, but no immediate increase in the purchasing power of the farmers would seem to be impending. The condition of the farmer is illustrated by the chart of grain prices and the retail prices of the commodities usually purchased by farmers. It will be noted that the price of these commodities has been constantly rising of late, while the price received by the farmer for his grain has been standing still.

Then, we must also consider the present outlook for a prompt increase in foreign trade, which, unfortunately, does not seem to be very alluring, because while Europeans are anxious to buy in our market, they have no way of paying for their purchases. The chart showing the exports from the United States illustrates the fact that while we are doing a considerable foreign business we are not carrying on an export trade that will support the full operation of our enormous productive capacity.

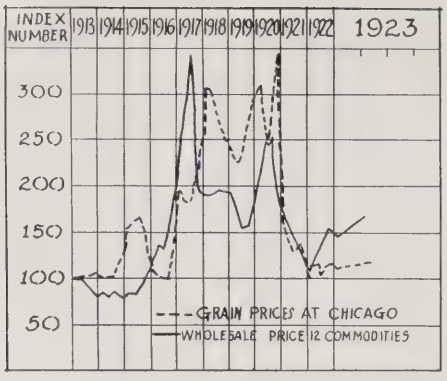
After carefully studying the important factors entering into our business activity we are forced to conclude that our building boom has been supporting our recent prosperity, and this is well illustrated by the chart showing building permits issued in the principal cities of the United States. Never in history have we had such a great amount of building, and the stimulating effect of this construction activity has been felt in practically all manufacturing lines.

In view of existing conditions it is of great importance for us to note that at the present time there are indications that increasing costs will slow up building activities, and that there are many current reports of a buyers' strike. Of course, if such a "strike" should come about, there may develop a belief that it will be well to wait for a considerable fall in building costs before going ahead with building contracts, and this would be a very unfortunate development, because if our building activities are now interrupted, the chief support of prosperity will be withdrawn and some degree of business recession will follow. It would therefore seem as if those who are engaged in the building industry could render a great service to themselves and to the country if they were now promptly to adopt the slogan, "Build in 1924," for such a slogan would tend to hold costs down during 1923, prevent any undue spread of the talked-of buyers' strike, and at the same time keep the people of our country in a mood to build. Prospective building activity in 1924 would tend to convince the people that it would be unprofitable to cancel building plans with the idea of waiting for prices to go to the "bottom," as an active year in 1924 would mean that there would be no "bottom" for some time to come.

All well informed business men admit the possibility of a moderate business recession before the end of the year; nevertheless it would seem that those engaged in the building industry are the "pinch hitters," who may be able largely to pre-



Charts showing extent of construction activities in the United States and in six regional divisions or the country



Values of Products Sold and Bought by Farmers

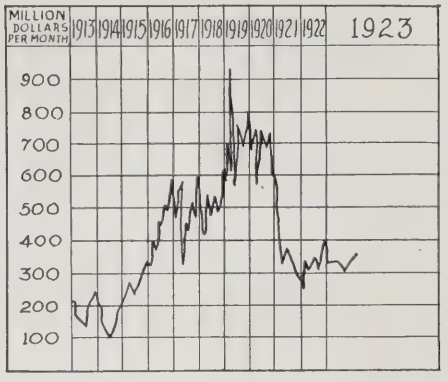
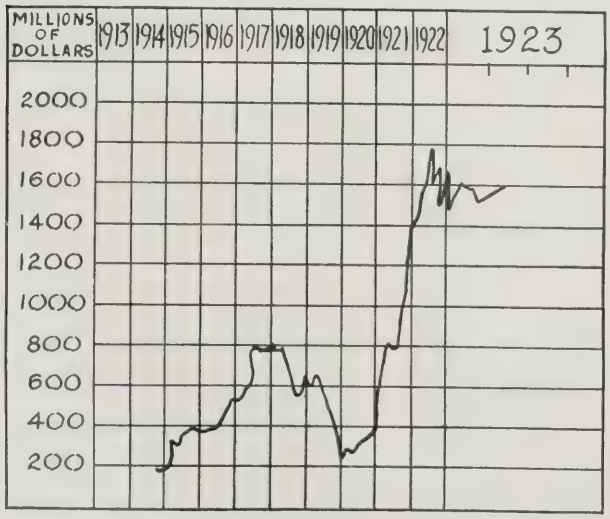


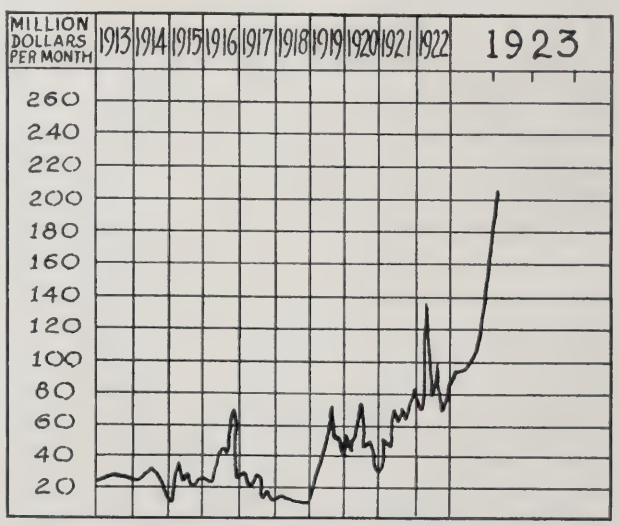
Chart Showing Extent of American Exports

vent this threatened slump. If our present building activity proceeds to fall down, the ensuing business recession will considerably decrease our prosperity until we can gather ourselves together for a fresh start, but if the building industry is able to tide us over into 1924 we may then find that a settlement of European social and political questions will make possible the sale of large amounts of foreign securities to American investors, and the proceeds of the sale of these securities would be used by Europe for the purchase of American goods. Such a development would prolong our prosperity for some time to come, because of the manufactured goods that would be shipped to foreign shores and because of the increased purchasing power of the grain growing sections of our country that would follow the increased demand for agricultural products on the part of the people across the sea. Upon the intelligence, team work, and vision of American builders now depends the immediate continued prosperity of the nation.

Considering all affecting conditions, it would seem quite logical that we may expect a period of long continued prosperity in the building industry by reason of a well maintained demand for new structures, if no unfortunate complications bring about a loss of confidence in the building field from both the mortgage investment and the equity investment viewpoints. It is to be hoped that the curtailment of building programs will not be carried out in a manner discouraging to the investing public, and that the advice given to the public through channels of publicity will explain this curtailment not as a desperate reaction against increased costs but as a logical extension of the building program to ease the present situation in a manner which will render unnecessary any further cost increases, and may as a matter of fact bring about a return to lower cost levels for good of the industry. Because of the nature of their production, it is illogical to expect a great increase in the available supply of building materials. The investment required is too large, the time required is too long, and profits would not justify such measures to meet the temporary condition of demand. With the relief which will naturally be afforded as cheap speculative projects are forced out of the market and comparatively unnecessary building projects are withdrawn, it would seem that a sound condition should develop in the construction field, involving a definite demand for a high type of architectural design and specifying the use of quality materials and good equipment. Rather than withdrawing from the market, loaning interests should become more discriminating in this respect and should appraise plans and specifications on a basis of quality, low depreciation and low maintenance costs, which are assured by the use of efficient planning and good materials. This action will help materially to check the economic drain which results from the depreciation and waste of cheap construction, and should tend to maintain the building industry on the basis of sound prosperity which is important not only within its own circle, but as a strong contributory factor in stabilizing prosperity in the United States during the next few years. Much depends upon developments of the next few months.



Building Permits Show that Industry is Enjoying Record Activity



Excess Federal Reserves Still High and Adequate for Financing Prosperity

The Architect's Troubles

AS SEEN BY AN ENGINEER

By WALTER W. CLIFFORD, *of Clifford & Roeblad*

THE relations of architects, engineers and the public have given the interested parties some thought during the last few years. Some of the confusion in discussions arising therefrom seems to have been due to a laxness of definition as to what constitutes an architect or an engineer. In most states there is nothing to restrain any individual from calling himself by either name. The general public may be forgiven for the error of judging a profession by its less qualified members, but there seems less excuse when members of one profession judge those of an allied profession similarly.

The members of a single profession may not agree among themselves as to its scope. Robinson* says: "We must therefore think of true architecture, not as the development of economical planning" and "not as the expression of construction . . .," while Statham** speaks of "the few perfect styles, each of which is the expression of a structural method." The one is exemplified by the architect pained at the crass spirit of a client who complains about a house because it is unlivable when it is admittedly pleasing to the artistic eye; the other, somewhat broadly, by the architect who cries out that the engineer is robbing the world of its æsthetic birthright by designing the simplest type of structure.

The "box type" of factory building, which the engineer is accused of foisting on an indifferent world, comes in for its share of architectural criticism ever and anon. Perhaps, though, criticism is a bit too flattering a term for the attention bestowed on such a structure. But let us consider for a moment that which Henry Ford calls "bunk."

Structurally the Egyptians and Greeks followed along the same lines of short lintel construction. The mechanical limitations of stone beams and the unexplained aversion of these people to the arch defined the form of their construction. With all their lack of refinement, the Egyptians achieved what Statham says "must have been one of the finest and most impressive interior effects ever realized in architecture." And the Greeks, with the same limitations, backed by a great civilization (Wells to the contrary notwithstanding), gave us the best of the wondrous monuments of antiquity. The Roman arch, vault and dome contributed to construction and architectural design, an advance in construction methods developing a new architectural style. When in Byzantium they developed pendentives, it would seem that construction was adapted to design without a sacrifice of quality in either. So the Romanesque developed into the Gothic, when the broken arch came to the rescue of the designer. All this time construction and art went hand in hand for the simple reason that they were ideally situated for co-operation, namely, in the same individual's brain.

Incidentally, if we except the few theaters and an occasional bath or other not too common building, architecture limited itself to religious buildings, although some utilitarian structures like the aqueducts show the advantage of having the architect and engineer one and the same. Industry in a modern sense was not yet born, and the housing of the proletariat occupied little of the architects' time or attention.

Before the first of the Egyptian temples was built mankind had emerged from the stone age into the iron age. But in the matter of building, the iron age may be said not to have been reached until the Gothic monuments of the stone age were sufficiently far in the past to be venerated and copied. To the short stone lintel and the arch the iron age brought the long lintel construction, the noticeably distinctive feature of modern building. Excepting where the merchant demanded clear show window space, where has the modern construction been so honestly displayed as in the factory? "Honest but ugly," we hear. Yes. Still in most cases it is possible to so proportion columns, spandrels and openings that a pleasing as well as an honest effect is obtained, at no additional cost. It is, to be sure, more difficult to achieve satisfactory design in such simple members and materials than with all the range of terra cotta veneer, but mere difficulty does not discourage the architect.

Concrete is the most modern of construction materials. It is masonry without joints. This characteristic has been frankly considered in some bridge designs, resulting in really graceful structures. The Germans have built a few buildings taking their outlines from the monolithic concrete bent,—huge, powerful, honest and cumbersome in effect. But these efforts represent an infinitesimal percentage of the concrete buildings. These buildings afford examples of the need of co-operation between the architect and the engineer. The factory owner considers the architect too impractical, and may admit that he does not like to look at the work of his engineer, but as a matter of economic necessity, if he must choose between them, he is obliged to turn to the engineer.

One architect lays the sad things in the life of the architectural profession to the fact that this is a commercial age. A horribly cynical viewpoint, this! And is it true? With all its infantile failings, is not the taste of the "common people" (how short a time it has existed at all!) really improving? The literary man has much more cause to complain than the architect. The gingerbread age in architecture has largely passed, while in writing we are at the height of a similar period.

As a symptom of the commercialism is the fre-

*"Architectural Composition."
**"A Short, Critical History of Architecture."

quently made statement that success in any line is proportional to selling ability. Whether we like it or not, this is true in a large degree. At first glance it seems detrimental to the development of taste in architecture, but consider why salesmanship was relatively less important a few generations ago. Was it not because wealth was so limited in those days that there were practically no buyers excepting for the limited staple necessities? The present success of salesmanship is due to increased purchasing power and, more important still, to a desire on the part of the individual to think for himself, and a commendable desire to be shown.

The architect is often rightly accused of weakness in salesmanship. We speak not of the commonly discussed selling of services, but of the more abstract problem of selling ideas. This applies to the architectural profession as a body as well as to the individual. Cement and its uses are much better known to the public through the Portland Cement Association than architecture and its advantages through the efforts of any architectural body. The National Geographic Society syndicates geographical information for the enlightenment of the public in what might be called a commendable way. Edward Bok, pioneering in the *Ladies' Home Journal*, did more to influence the minds of the great public in architectural matters than anyone else, as he naively admits in "The Americanization of Edward Bok." Unfortunately, some of his followers have done much to neutralize any good results which he may have achieved.

The individual architect falls short of the best in selling when he vetoes his client's ideas with the blunt explanation that they are not good. He may awe the client, but how often does he try to *convince* the client, and how often does he take full advantage of his opportunity to *educate* the client?

The application of the words "architect" and "engineer" through the centuries is of interest. Vitruvius, by his insistence that an architect must have a musical ear, that he might properly tune *ballistæ*, would indicate that he included even the army engineers as architects. Not long after this the army construction men took unto themselves the title "engineer," and for centuries the engineer was a military man. All civilian construction, including bridges and hydraulic works, was in the hands of the architects. A few centuries ago the architects who built bridges and such work, which would now be called engineering, wished to call themselves engineers. It took time to overcome the opposition of the engineers of the army, but eventually "civil engineers" were recognized. Since that time mechanical, electrical, mining, sanitary and hydraulic work have become recognized specialties in engineering, and many other men have added "engineering" to the description of their work in order to gain dignity or popularity. Architecture, on the other hand, has not been divided into recognized specialties. In most large modern buildings which are expected to make a return on money invested, architecture and structural, mechanical and electrical engineering are involved. Expert ability in two of these is unusual for one man, and real expertness in more than two we do not expect to find. The architect views work from the æsthetic standpoint and the engineer from the utilitarian. This seems to be a fundamental difference. The two viewpoints seldom seem to combine in the one man, so that in addition to professional skill there arises need for the ability to co-operate with others for both the architect and the engineer, and for both from time to time the necessity of successfully co-ordinating the work of others.

When engineers and architects learn to appreciate each other and co-operate as whole groups to an extent which has been done in a few individual cases, there will be no cause to complain of the unsightly boxes built by engineers or the impractical designs of the architect, and the client will be properly served.

Panel over Entrance of Office Building, Brotherhood of Railroad Trainmen, Cleveland
Charles S. Schneider, Architect. Ulysses A. Ricci, Sculptor

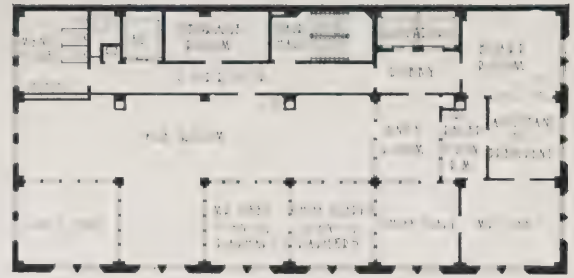
GENERAL EXTERIOR VIEW

BUILDING OF BROTHERHOOD OF RAILROAD TRAINMEN, CLEVELAND

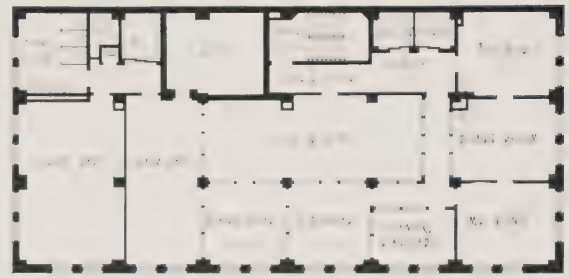
CHARLES S. SCHNEIDER, ARCHITECT

Photos by Clifford Norton

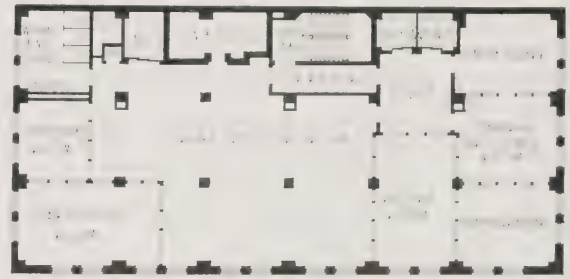
DETAIL OF ENTRANCE



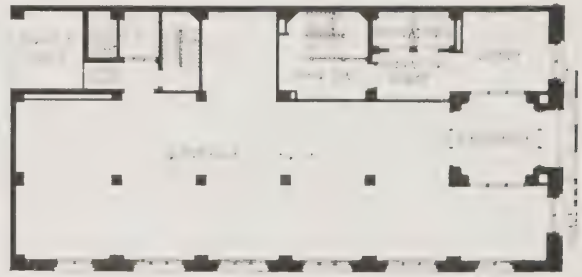
NINTH FLOOR PLAN



SEVENTH FLOOR PLAN



SIXTH FLOOR PLAN



FIRST FLOOR PLAN

BUILDING OF BROTHERHOOD OF RAILROAD TRAINMEN, CLEVELAND

CHARLES S. SCHNEIDER, ARCHITECT
ULYSSES A. RICCI, SCULPTOR

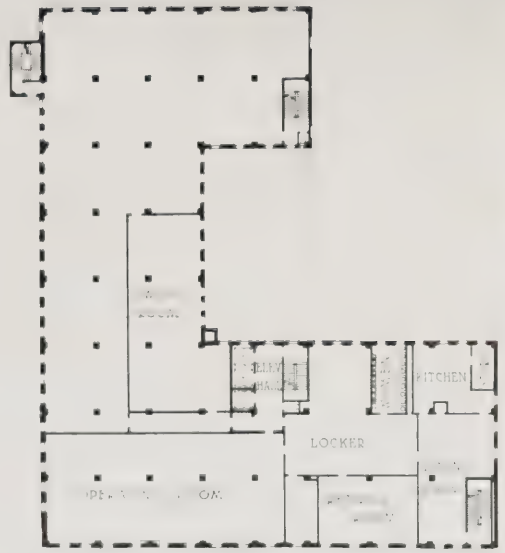
ENTRANCE VESTIBULE

ELEVATOR LOBBY

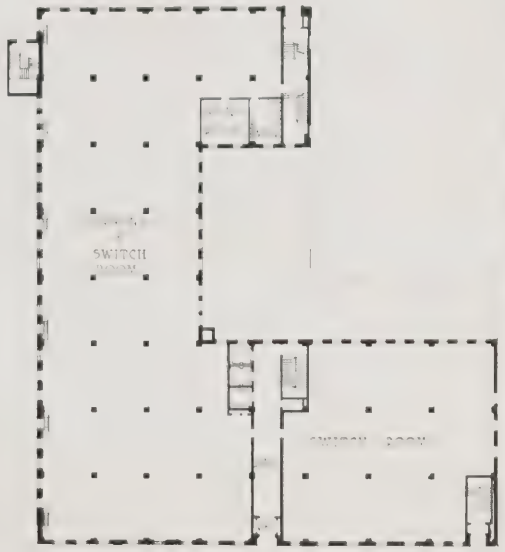
BUILDING OF BROTHERHOOD OF RAILROAD TRAINMEN, CLEVELAND

CHARLES S. SCHNEIDER, ARCHITECT

FAUSTINO SAMPIETRO, MURAL PAINTER

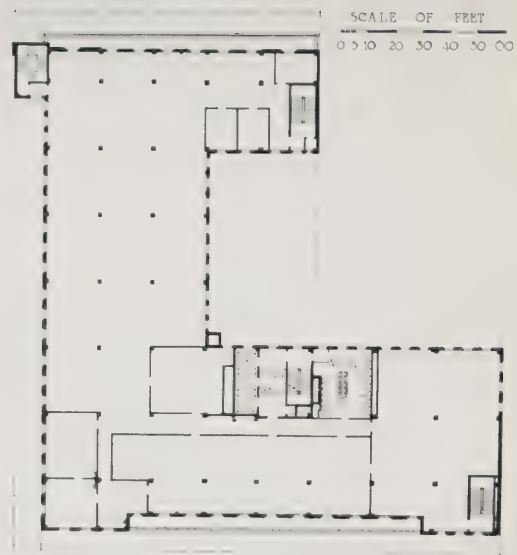


SECOND FLOOR PLAN

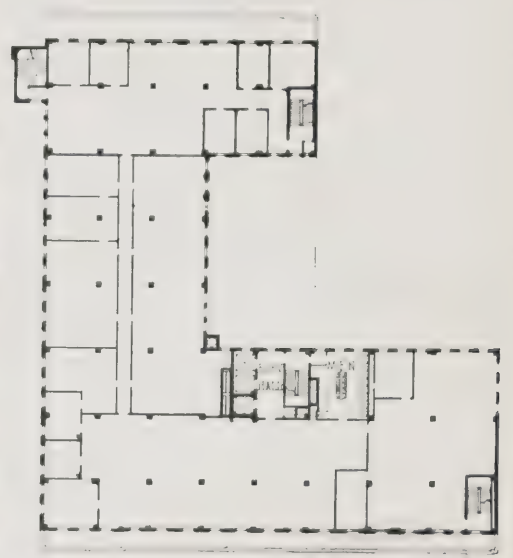


FIRST FLOOR PLAN

GENERAL VIEW OF EAST 30TH STREET FACADE
NEW YORK TELEPHONE COMPANY BUILDING, NEW YORK
McKENZIE, VOORHEES & GMELIN, ARCHITECTS



EIGHTH FLOOR PLAN



SIXTH FLOOR PLAN

DETAIL OF UPPER STORIES

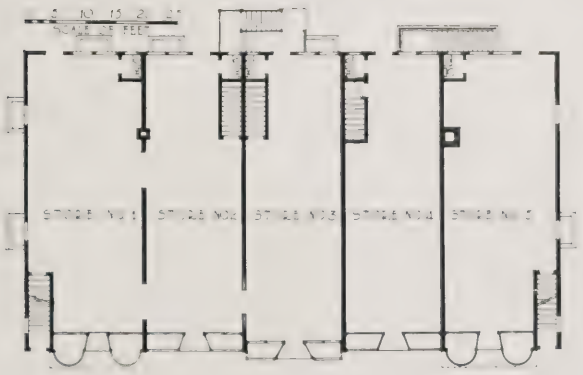
DETAIL OF ENTRANCE

NEW YORK TELEPHONE COMPANY BUILDING, NEW YORK

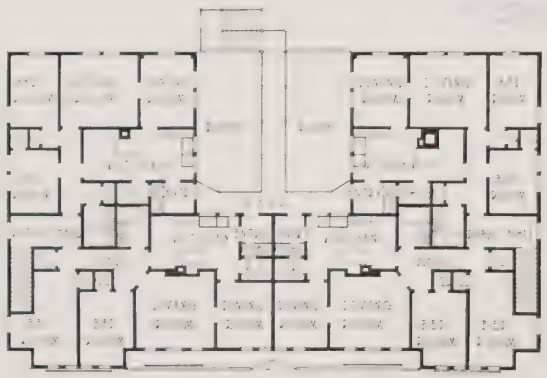
McKENZIE, VOORHEES & GMELIN, ARCHITECTS

Photos by Tebbs Architectural Photographic Co.

GENERAL VIEW OF FRONT



FIRST FLOOR PLAN



SECOND FLOOR PLAN

SHOP AND APARTMENT BUILDING, FALMOUTH, MASS.

HUTCHINS & FRENCH, ARCHITECTS

DETAIL OF END BAY

DETAIL OF FRONT

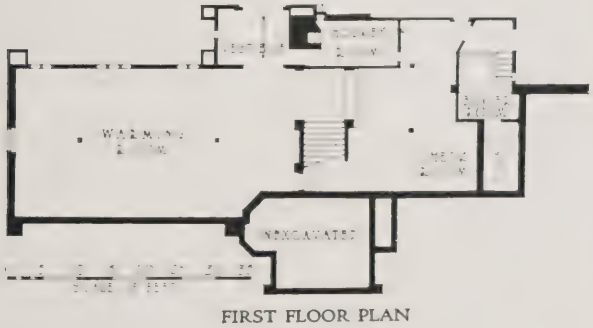
SHOP AND APARTMENT BUILDING, FALMOUTH, MASS.

HUTCHINS & FRENCH, ARCHITECTS

Photos by Paul J. Weber

GENERAL VIEW FROM LAKE

SECOND FLOOR PLAN



FIRST FLOOR PLAN

DETAIL OF ENTRANCE

JOHNNY PARSONS CLUB, CORNELL UNIVERSITY, ITHACA

ROGER D. McPHERSON, ARCHITECT

Photos by the Architect

ENTRANCE FROM LAKE

ENTRANCE FROM CAMPUS

JOHNNY PARSONS CLUB, CORNELL UNIVERSITY, ITHACA

ROGER D. McPHERSON, ARCHITECT

VIEW OF RESTAURANT

RESTAURANT FROM ENTRANCE HALL

JOHNNY PARSONS CLUB, CORNELL UNIVERSITY, ITHACA

ROGER D. McPHERSON, ARCHITECT

DECORATION *and* FURNITURE

A DEPARTMENT
DEVOTED TO THE VARIED
PROFESSIONAL & DESIGN INTERESTS
WITH SPECIAL REFERENCE TO
AVAILABLE MATERIALS

INTERIORS OF MODERATE COST AUSTRIAN HOUSES SHOWING MODERN MACHINE MADE FURNITURE EXECUTED FROM DESIGNS OF HUGO GORGE, ARCHITECT

Recent Austrian Styles in Furniture

By HUGO GORGE

THE world war was responsible for much revision in values. Before 1914 Europe, as well as most of the rest of the world, was governed by a desire for display. The people grew accustomed to living what might be called a dual life, real and false, in which the false played by far the greater part; only a few were interested in the realities of life, and so it has remained until comparatively recently. All this holds true in a particular degree with what made up the furnishings of the home; domestic furnishings of all sorts were chosen for the most part with an eye to their showy qualities, and while excellence of workmanship existed, the popular demand was not so much for objects well designed and carefully made as for furnishings which would afford the maximum of display at the minimum of cost. Of no country was this more true than of Austria, where fondness for the merely showy was among a great part of the people carried to an extreme.

In this respect the end of the war brought a welcome change. We were forced to become more self-reliant and to utilize all available material and work in such ways as to make them useful and serviceable. Another factor which has brought about this change is the great scarcity of houses and dwellings. The law prescribes many restrictions in housing accommodations, and in conforming to these conditions we had to modify the furnishing and decorating of our homes. The "living room," which proved to be superfluous, has disappeared from most dwellings. Many people who were unable to find larger quarters turned the living room into a bedroom. In this way a new style in furniture has gradually been developed, which has been determined by the actual needs of the middle class population in Austria, by the available methods of work and kinds of materials, and by present-day technical achievements. The illustrations which are presented here show how architects have tried to accommodate themselves to the altered circumstances. In the opinion of many, these pieces of furniture show conclusively that it is possible to establish a style in furniture which has a permanent value irrespective of the fluctuations of fashion. We not only restrict ourselves in everything, but we also try to avoid anything that is false, that is to say not genuine, and that is superfluous. Furniture of good proportions, suitably dimensioned and well made, will make a good impression even without decoration, and will form serviceable objects irrespective of the whims of fashion.

The keynote of the new furniture is that it is adapted to the restricted facilities in satisfying everyday wants brought about by the war, so far at least as Austria is concerned. In this way new forms of furniture pieces have arisen which were unknown heretofore, and which were made with a view to satisfying all possible wants with a minimum of outlay in material and labor and at the same time preserving æsthetic qualities.

In this way a new style of furniture has sprung up among us in Austria which has become symbolic not only of our outward life, but also of our psychical development during and since the war. The pieces of furniture do not belong to the old world of art and handicraft, but to the new world of the machine, for which they are designed. As it is not possible to reconcile these two worlds, any embellishment of our modern furniture can only be of a constructive-symbolic sort. The emphasis is thus laid more on the variety of combination of the pieces of furniture and less on the individual pieces. For instance, we attempt to create a rich impression by way of contrast in placing chairs with carved backs against smooth, straight-lined cabinets and chests. In this way we manage to get in the same room a different and richer perspective and constantly changing harmonies as against the immobile chests and cupboards along the walls. But even these cupboards and chests are supported on tall legs in order to permit a view of the borders of parquetry, mostly beautifully wrought in dark woods. Wholesome tones in draperies and gay coloring in carpets enliven and enrich the entire ensemble of the rooms.

The interiors and pieces of furniture illustrated here have not all been made for special occasions. They were designed, produced, and made as the need for them arose, and it has been gratifying to note that before long similar pieces of furniture were being produced abroad, as this furniture was readily recognized as being adaptable to machine methods of manufacture. In pointing out its merits for machine production, it is not meant that furniture of exclusive design and workmanship will have no place in our modern home furnishings; the necessity for exclusive and valuable pieces of furniture will always remain, but on the other hand machine-made furniture, if satisfying distinct æsthetic wants and desires, will win more and more friends, especially if the new style is shown to be the logical expression of the needs of the times, and if it embodies purpose in construction and economy in material.

These examples will show what has been done to win over many people to a uniform, modern expression in furniture design and execution, and how practical requirements were reconciled with æsthetic wants. It will be seen that motifs have been adapted from a number of widely different sources, but so combined as to produce forms which are pleasing and full of expression, while being kept within the limits of what may be produced by the methods which present-day economic and industrial conditions in Austria render necessary.

INTERIORS OF MODERATE COST AUSTRIAN HOUSES SHOWING MODERN MACHINE MADE FURNITURE EXECUTED FROM DESIGNS OF HUGO GORGE, ARCHITECT

Constructing the Curved Stairway

By MOTT B. SCHMIDT

THE matter of constructing a curved stairway seems to have always been somewhat of a mystery to the layman, but it is very simple and merely requires, like any other stairway, the work of a good stair builder. Where the stair string under the handrail is closed with a partition, it is of course very easy to support the stairway on that partition, as all the constructional work of the stair can be entirely concealed. But, if the inner string under the handrail is without a partition to support it, one can then see under the stairs, and the construction must therefore be concealed in the stair soffit, just as in the case of a stair directly over another stairway beneath.

In this case, and when the outer edge or string of the stairway is formed by a partition or wall, the stair must be supported by braces or supports from that wall to the inner string of the stair. This inner string can of course be continuous from floor to floor, and together with the carriage or other support that is placed under or inside of it, forms in itself a sort of arch or truss that will take a considerable portion of the weight of the stairway. Then in the thickness of the soffit, supports are carried out at an angle so that they follow the curve of the soffit, the outer end of one support being carried by another at an intersecting angle, which in turn transmits its load to another support, and so on until the load is carried to the floor from which the staircase starts. The thicker the stair soffit can be made, the easier it is to provide sufficiently heavy supports, but even in a thin, graceful stairway, entirely of frame construction, the supports and carriages can be braced and trussed from the wall to the string, and from one brace to the other, so that a most rigid stairway can be built with little apparent support. Where a staircase is entirely free-standing, such as a curved stairway in a square well, the construction is done in the same manner, except that both inner and outer strings become continuous supports, with the braces trussed between them. Then at the mid-point of the stair, where it becomes

Stairway in House of C. W. Carr, Esq., Lake Forest, Ill.
H. T. Lindeberg, Architect

STAIRWAY IN HOUSE OF MRS. W. K. VANDERBILT, SUTTON PLACE, NEW YORK

MOTT B. SCHMIDT, ARCHITECT

more or less tangent to the wall, it is usually possible to provide an inconspicuous brace that is practically concealed from view.

When a stairway is of reinforced concrete, iron or steel, it is merely a definite engineering problem to provide sufficient strength to insure support, but it is possible to construct self-supporting stone steps so as to form a spiral stair, merely by placing one solid stone step upon another until the top is reached, and clamping them together with small iron braces near the inside edge, the whole then forming a keyed arch, which, like any arch, would collapse if one of the keys were removed.

In designing the spiral or curved stairway, the principal consideration must be that the risers and treads be properly proportioned at the point of usual travel—that is, that there be an easy relation of rise to tread at the place where a person usually walks up or down the staircase, which in an average stairway would be about 12 inches from the inside line of the handrail. Of course in any curved stair the treads will naturally become narrower as they approach the railing, and wider as they get farther from the center of the curve. A spiral or curved stairway properly designed will be more convenient of travel and an easier stair than a straight stairway of similar proportion, as well as being more graceful and pleasing in appearance. The one thing that sometimes makes a curved stair difficult of ascent is the fact that the steps are brought so sharply together as they approach the handrail that they become too narrow to allow sufficient space to walk. In very steep spiral stairs, which must be crowded into a limited space, the risers are sometimes cut out to allow room for the feet, to avoid the stubbing of the toes that would occur if the risers were solid. There are many such examples in old American houses, where such a stair was often supplementary to the main staircase of the house. They can be made beautiful, but not comfortable for general use.

In an ordinary commercial spiral stairway, such as is often built around a center post, the risers are generally entirely open.

Such stairways are often sold from stock designs, usually of iron or steel, and represent the least possible space in which a stairway can be placed. They are made as small as 3 feet, 6 inches in over-all diameter, and of course are so steep that adequate headroom is secured with each complete turn of the spiral. About the only other point in which the design of a curved stairway presents a problem differing from that of an ordinary stair, is in the matter of headroom, as occasionally the wellhole opening is so designed that while there is sufficient headroom when one takes the usual line of travel, close to the rail, the sharp, radiating lines of the treads bring the outer portions of the lower steps so far out as to end where sufficient headroom may be lacking.

Detail of Iron Balustrade, Curved Stairway, 35 Lincoln's Inn Fields, London
(Now in South Kensington Museum)

DETAILS OF REINFORCED CONCRETE CURVED STAIRWAY
HOUSE OF CHARLES H. SABIN, ESQ., SOUTHAMPTON, N. Y.
CROSS & CROSS, ARCHITECTS

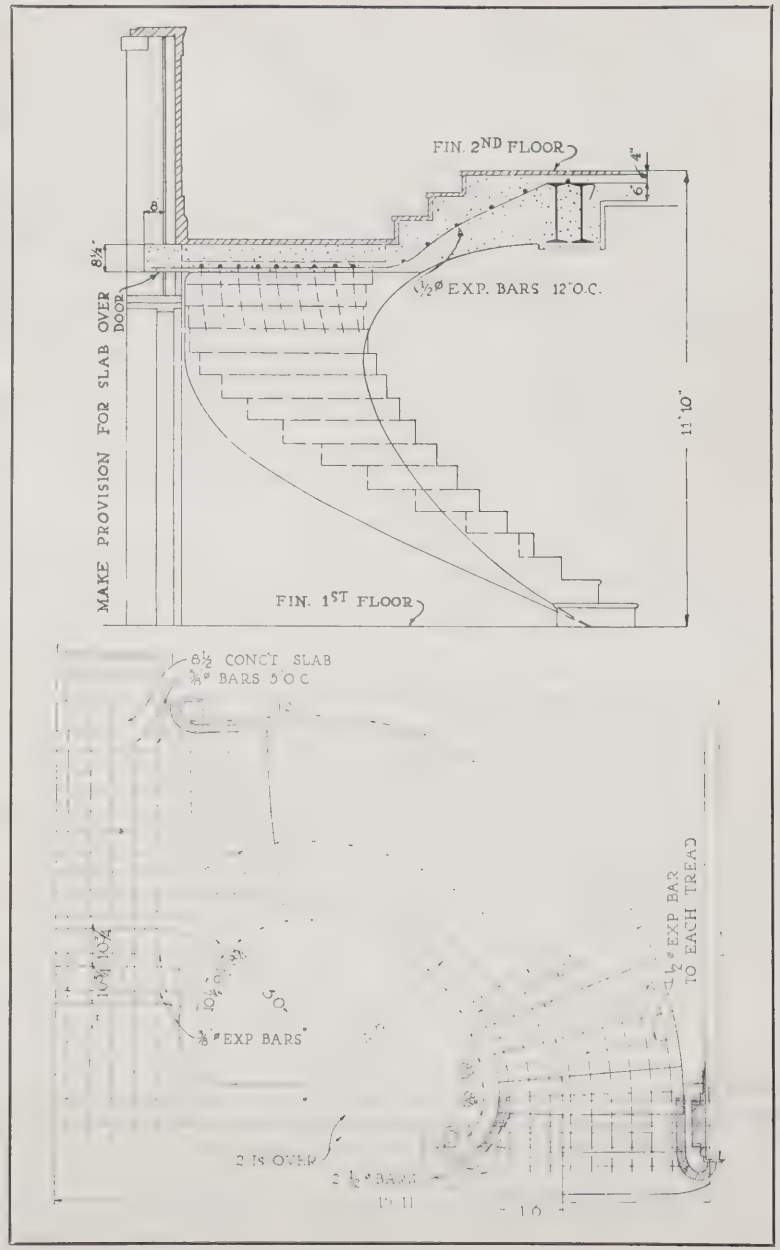


Plate Description

Building of the Brotherhood of Railroad Trainmen, Cleveland. Plates 7–9. This structure, of which Charles S. Schneider is the architect, is intended primarily for containing the executive offices of this organization, with the ground floor and certain of the upper floors arranged for renting as sources of revenue. Of fireproof construction, the building is of limestone and terra cotta. Windows of the first floor are provided with steel frames, the windows of the upper floors being of wood, double-hung and pivoted so that they may be easily cleaned. For the lobby and the corridors of the building the walls as well as the floors are of marble. In the offices the floors are of composition, and the woodwork throughout the building is of walnut. Heating is supplied from a vapor system, and electric power is used for the operation of the elevators. The building contract was let April 15, 1921, and the cost of the structure was 83 cents per cubic foot.

Much of the interest of the building is due to the appropriate use of sculpture, painting and wrought metal. Ironwork in the forms of grilles, lanterns at the main entrance, screens about the elevator shafts and elsewhere is from the forges of Samuel Yellin, and the sculptured panel above the principal entrance to the building is the work of Ulysses A. Ricci, while the ceiling of the vestibule, painted by Faustino Sampietro, is one of the artist's most interesting examples of mural decoration.

Building for the New York Telephone Co., East 30th street, New York. Plates 10, 11. The rapid development of the New York telephone service is indicated by the number of large buildings which have been erected during the last few years for the accommodation of central offices and for other departments of this vast public service corporation. The structure illustrated here, situated in the block bounded by 30th and 31st streets and Second and Third avenues, while by no means the largest telephone building in New York in the extent of its floor area, covers a larger plot than any of the other central office structures. The building is L-shaped and extends through the block, occupying the entire depth of a New York block, about 200 feet.

In its exterior design the building shows the excellent use which may be made of the setback made necessary by the present New York building laws. The building is as nearly fireproof as modern skill and building methods can make it, and is of steel and brick construction with trimming of limestone. As in all recent buildings belonging to the New York Telephone Co., there is included a fire tower which affords an enclosed fire escape, and in addition there are three stairways enclosed with fireproof walls and fitted with fireproof doors, the effort of the architects, McKenzie, Voorhees & Gmelin, having been to safeguard in every way the lives of those working in the building and to eliminate the danger of destruction by fire of very costly apparatus.

Shop and Apartment Building, Falmouth, Mass. Plates 12, 13. The designing of business structures for small towns and villages presents so many opportunities for the securing of excellent architectural results that it is surprising how seldom the opportunities are improved, particularly since such a building when well designed and planned possesses far greater value for its owner and is likely to be a more profitable investment than the usual village store building which is wholly lacking in architectural character. A structure tastefully designed and well planned does more than its share toward the improvement of its surroundings.

What may be done with a building such as is likely to be built in any small town or village is illustrated by this shop and apartment structure of which Hutchins & French are the architects. Wood has been used as a building material and shingles for roofing, while the interior trim is of N. C. pine stained. The exterior walls are painted white, the roofs are stained brown, and the shutters are dark green, a color combination which added to the excellent architecture would tie the building into its place on any village street. Heating is from a vapor system. The contract for this building was placed in March, 1922, at a cubic foot cost of 32 cents.

Johnny Parsons Club, Cornell University, Ithaca, N.Y. Plates 14–16. Of the various problems which come into an architect's office there are few which are more interesting than the designing of a building which is to be devoted in a large measure to amusement, such as a theater, particularly a theater of minor scope, or a structure devoted to various forms of out of door sport, where the very atmosphere suggests play and informality. A particularly interesting result in the working out of such a problem is found in this clubhouse upon the campus of Cornell University, Roger D. McPherson being the architect.

Owing to the steepness of the grade upon the western shore of Lake Beebe, where the clubhouse is built, the structure is one story in height upon the entrance side and of two full stories upon the side facing the lake. The exterior walls are coated with hand troweled plaster of moderately rough texture, and the gables are covered with chestnut weatherboarding. The roofs are covered with black slates laid in uneven courses, these different materials creating a pleasing color combination.

Within the clubhouse the walls are sand finished in pale buff, and the exposed structural timbers are given hand-adzed surfaces stained light natural brown, while other interior woodwork is of rough sawn chestnut. Floors are of polished red oak except in the entrance hall and for the area before the fireplace, where the floors are laid of blue flag stones. Heating is by steam. The building contract was let in April, 1922, and the cost of the structure was about $24,000.

EDITORIAL COMMENT

SYMBOLISM IN ARCHITECTURE

FROM the beginnings of architecture certain forms have been closely associated with definite types of building. It is not alone in character of ornament, which is perhaps first thought of when symbolism is mentioned, but in the general mass and outline of buildings that standards have arisen which permit the purpose of a building to be recognized at a glance. The church, of course, from the tenth century through the renaissance was the great patron of architecture, and it was while in the employ of the church that architects and master builders developed the characteristic forms and details of the later great styles. Thus the Gothic spire grew out of the desire to give physical expression to the aspirations of the church; later the campanile and tower were evolved, to indicate the locations of seats of municipal government, and the dome was about equally divided between religious and civic service. These architectural forms have always necessarily been expensive to construct, and this may account for their practical exclusion from ancient buildings other than those given over to religious or civic purposes. We think, however, there is another, more real, reason; it is that symbolism in architecture was at one time an active force; the province of the spire, campanile, and dome was respected, and they were purposely kept from serving other than the church or state.

Commercialism is a force that has to be reckoned with in the world today. It has little tradition, and in seeking a physical expression, which is entirely reasonable, it has no background upon which to depend for suggestion; it has had, therefore, no compunction in appropriating to its use these architectural symbols that for centuries have stood for definite things. Should not this be a matter of great regret, and is it not worthy of the serious thought of architects? In their hands is placed the keeping of the great traditions of architecture, to be perpetuated for all time or to be debauched and cheapened, as their intelligence and respect for their art dictate. We should not acknowledge ourselves incapable of interpreting our own time to future generations, and modern commercialism is a factor of our civilization that will leave its mark; it warrants its own symbolism, however, and should not be decked out in forms that for ages have represented civic and religious dignity. It is the function of the modern architect to accomplish this result; his creative and constructive talents will be strengthened by solving today's architectural problems with the same unfettered reasoning that has produced the problems themselves.

It may be argued that as commerce is so vital a factor in our lives, it is appropriate to clothe it in the most commanding forms we know. The value of these forms as arresting objects lies in their comparatively infrequent use; generally adopted, they would create a babel. That confusion already exists in the public mind is suggested by the cartoon reproduced herewith from the Boston *Herald* on the present tendency to build miniature courthouses and capitol buildings for gasolene stations. The newspaper humorist says: "It is going to be easy to find a gas station in the future. Just pick out the most magnificent and imposing edifice in the town, and that will undoubtedly be it. Of course these buildings with their sunken gardens and ornamental trees may cause confusion for a while by being mistaken for courthouses or libraries by strangers, but they will soon get over that idea."

The "gas" station is perhaps an interesting spot in the whir of the landscape to the motorist, and may be permitted its little joke. The recent example of an attempt to produce a monument to American business success in the Chicago *Tribune* building is more serious and indicates the paucity of our ideas; every symbol from that of Mohammedanism to Gargantuan German kultur was pressed into service—and by architects. This may be democracy and it may be safe in the hands of architects, but it is well for the future evaluation of our civilization that by good fortune all these designs were not really executed in brick and stone.

Cartoon by Franklyn Collier, Boston Herald

Interiors of Enduring Charm at the Hampton Shops

ADAPTED from delightful old French designs to the requirements of today, each detail of this interior has the beautiful lines and the exquisite hand carving of that work of the old cabinet-makers which has retained its charm through centuries of changing times and fashions. Yet these pieces, constructed by masters of cabinet-working who have come to us from France, are made with an understanding of laminating and treating the woods to withstand our peculiar climatic conditions.

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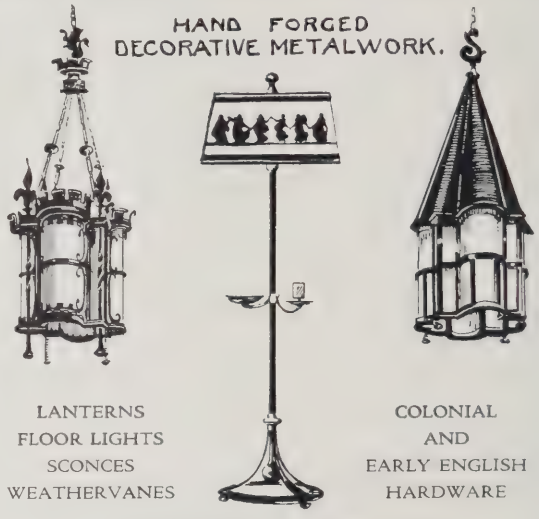

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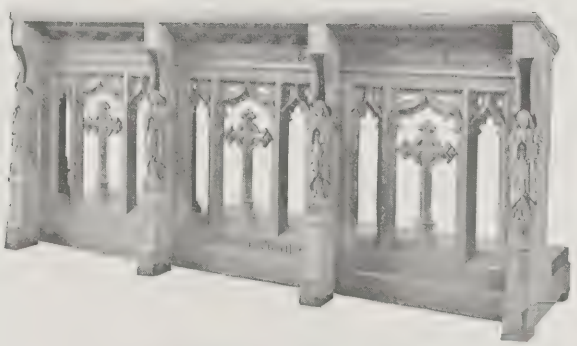

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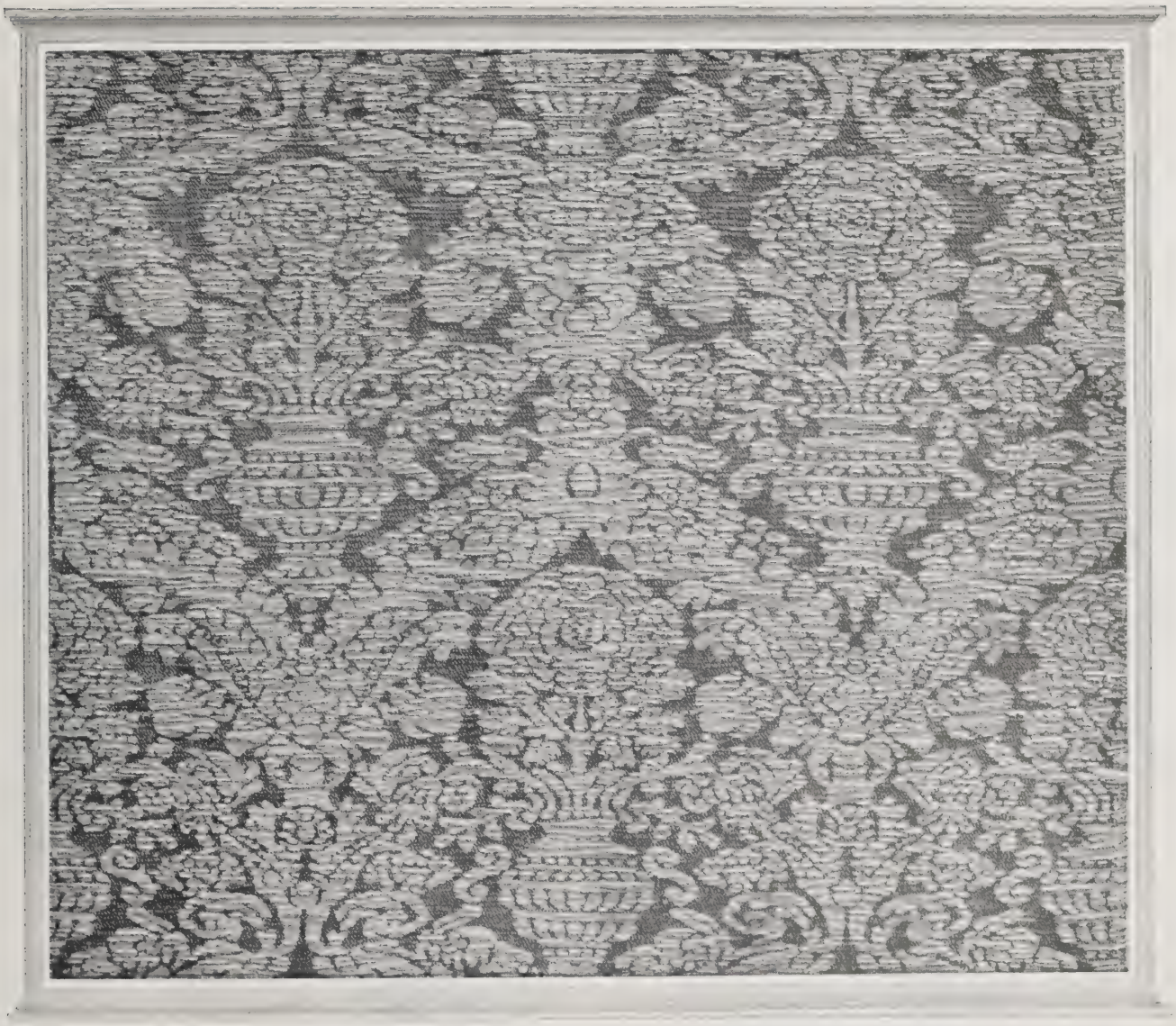

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American Museum of Natural History, 77th street & Central Park West.—Paintings of South American Indians by A. Hyatt Verrill.

Arlington Galleries, 274 Madison avenue.—Exhibition of American paintings.

Babcock Galleries, 19 East 49th street.—Annual summer exhibition of American paintings.

George Gray Barnard's Cloisters, 454 Fort Washington avenue.—Open daily except Mondays.

Brummer Galleries, 43 East 57th street.—Paintings by contemporary French and American artists.

City Club, 55 West 44th street.—Exhibition of etchings.

Daniel Gallery, 2 West 47th street.—Paintings by a group of modern artists.

Dudensing Galleries, 45 West 44th street.—Summer exhibition of small paintings by American and European artists.

Durand-Ruel Galleries, 12 East 57th street.—Exhibition of modern French paintings.

Ehrich Galleries, 707 Fifth avenue.—"Old Masters" and modern American paintings.

Mrs. Ehrich's Gallery, 707 Fifth avenue.—Exhibition of metal work, linens, Cantagalli glass and antique furniture.

Fearon Galleries, 25 West 54th street.—Summer exhibition of old and modern masters.

Ferargil Galleries, 607 Fifth avenue.—Exhibiton of American paintings; sculpture and wrought iron by Hunt Diederich.

Folsom Galleries, 104 West 57th street.—Special exhibition of American paintings.

Grand Central Galleries, 6th floor, Grand Central Terminal.—Exhibition of American painting and sculpture.

Kennedy Galleries, 693 Fifth avenue.—Currier and Ives lithographs.

Keppel Galleries, 4 East 39th street.—Etchings by Rembrandt and engravings by Dürer.

Knoedler Galleries, 556 Fifth avenue.—English and French color prints; contemporary American and French paintings.

Kraushaar Galleries, 680 Fifth avenue.—Etchings by M. A. J. Bauer.

John Levy Galleries, 559 Fifth avenue.—American and foreign paintings.

Lewis & Simmons, 612 Fifth avenue.—Old masters and Barbizon paintings

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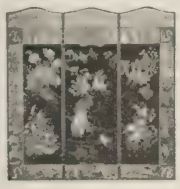

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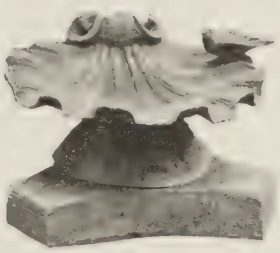

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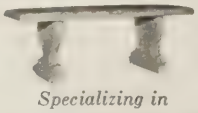

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Macbeth Galleries, 450 Fifth avenue.—Paintings by American artists.

Metropolitan Museum, Central Park at 82nd street.—Loan exhibition of the Arts of the Italian Renaissance; Italian engravings and woodcuts; exhibition of American handicrafts; Japanese swords and sword blades.

Milch Galleries, 108 West 57th street.—Special exhibition of paintings by American artists.

Montross Gallery, 550 Fifth avenue.—Paintings by a group of American artists.

Mussmann Gallery, 144 West 57th street.—Modern paintings and etchings.

National Sculpture Society.—Indoor and outdoor exhibition of American sculpture at the museums located at 156th street and Broadway, to August 1.

N. Y. Public Library, Fifth avenue and 42nd street.—"Making of a Japanese Print." Recent additions to the print collection.

Ralston Galleries, 4 East 46th street.—XVIII century English portraits and Barbizon paintings.

Reinhardt Galleries, 606 Fifth avenue.—Ancient Indian and Graeco-Buddhist sculpture.

Salmagundi Club, 47 Fifth avenue.—Summer exhibition of oil paintings by members, to October 15.

Schwartz Gallery, 14 East 46th street.—Exhibition of modern etchings.

Scott & Fowles Galleries, 667 Fifth avenue.—Paintings by XVIII century and modern masters; sculpture by Mario Korbel and Paul Manship.

Mrs. Sterner's Gallery, 22 West 49th street.—Exhibition of American paintings.

Arthur Tooth & Sons, 709 Fifth avenue.—Exhibition of Barbizon paintings.

Wiener Werkstaette of America, 581 Fifth avenue.—Exhibition of Viennese art.

Howard Young Galleries, 634 Fifth avenue.—American and European paintings.

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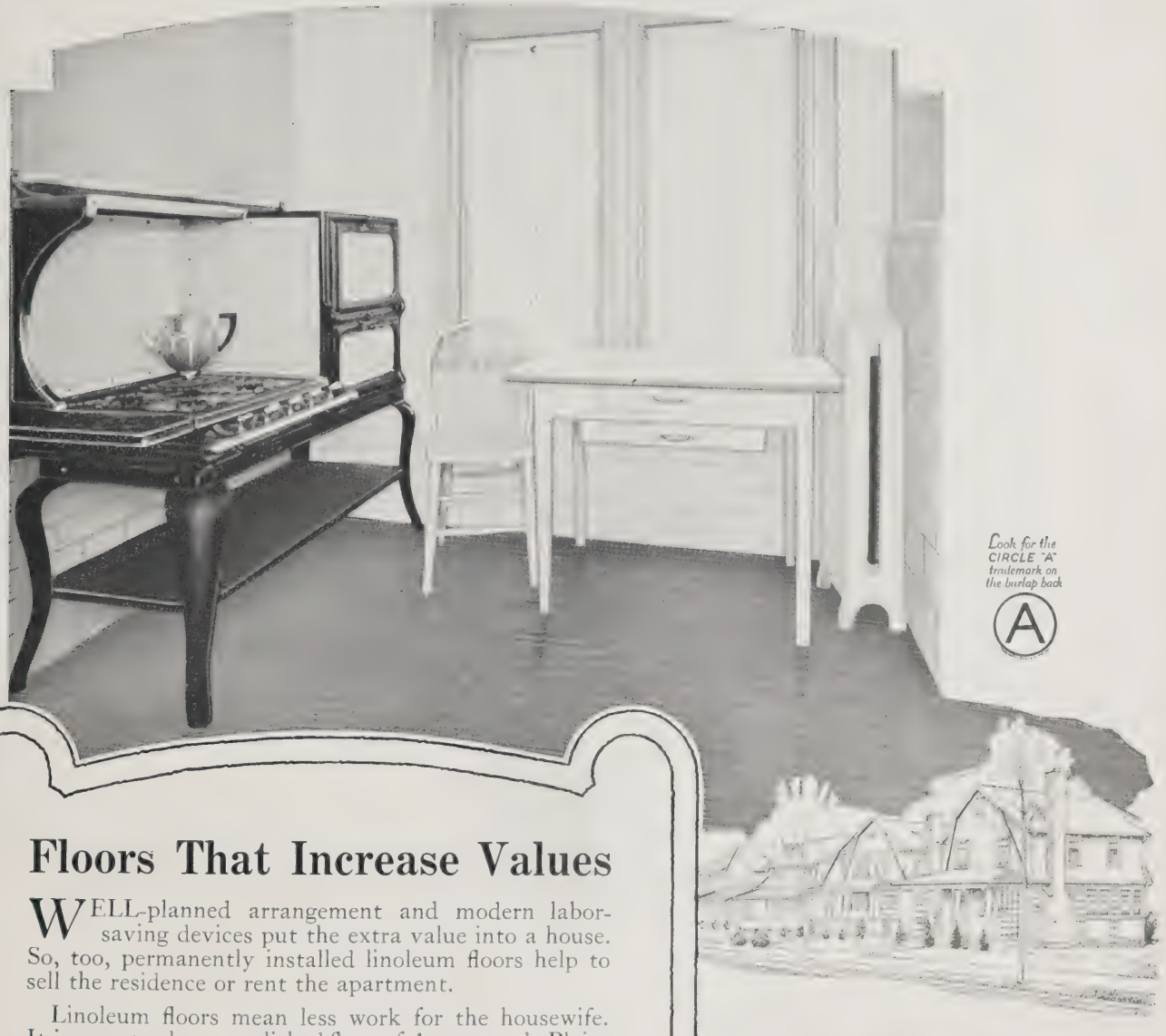

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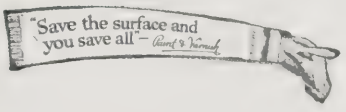

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of THE ARCHITECTURAL FORUM

Information on economic aspects of construction and direct service for architects on subjects allied to building, through members of THE FORUM Consultation Committee

The Building Situation

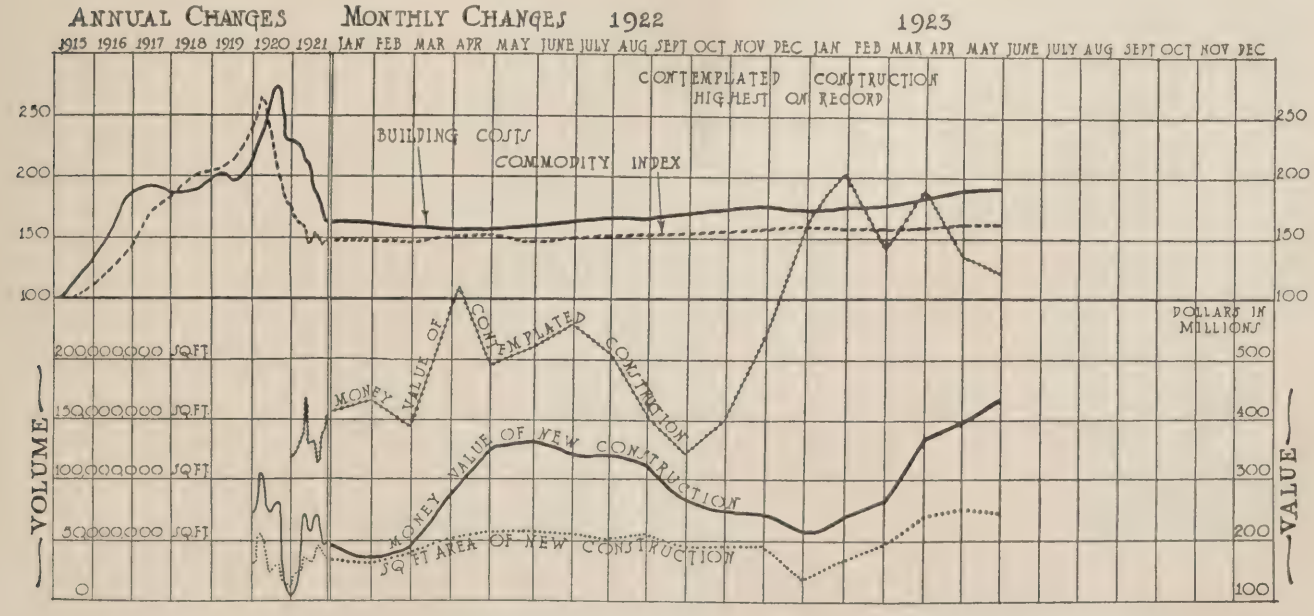
IT is quite probable that in the history of American building construction there has never been a period of such tense interest and uncertainty as that developed during the early months of this year.

Month after month records have been broken in the national total of money invested in construction enterprises. The index of building costs has veered sharply upward as material prices and labor costs have advanced.

The month of May has shown the greatest volume of new construction ever started in a given equal period of time, probably well over one-half billion dollars for the entire country! But costs are continuing to advance as these records are established. It is an obvious fact that increasing volume and increasing costs are not compatible. The limit must soon be reached, and interesting questions relate to the form of this climax and its after effects on the industry. Will there be a general "buyers' strike"? Will building costs decline sharply? Will building activity stagnate? These are questions which cannot be answered accurately, but there are logical comparisons and deductions to be made as pointed out in the Business and Finance Section of THE FORUM this month.

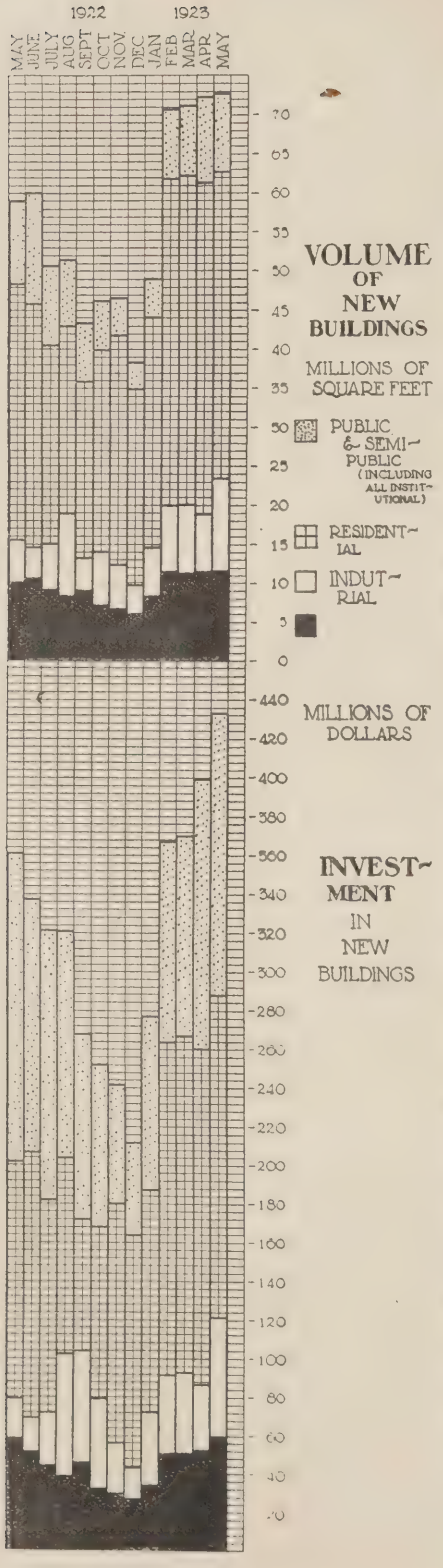
A study of the chart given here will show that the volume of actual contracts let is following logically the course indicated by the record-breaking volume of contemplated construction (plans filed). Because of seasonal conditions, cost increases and withdrawal of projects, it may be expected that a sharp decrease will occur soon in the volume of construction.

On a basis of conservative appraisals, discounting almost entirely all recent construction cost increases, ample mortgage money is available. The investing public is absorbing heavily all issues of sound mortgage bonds. Building loan associations and other mortgage financing groups report generally a surplus of money for loaning.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Commerce. (3) *Money Value of Contemplated Construction.* Value of buildings for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Co., and *Engineering News-Record.* (4) *Money Value of New Construction.* Total valuation of all contracts actually let. The dollar scale is at the right of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the left of the chart. The variation of distances between the value and volume lines represents a square foot cost which is determined first, by the trend of building costs, and second, by the quality of construction.

Factors of Fluctuation in Building Costs



THE above chart in the upper part indicates the approximate division of the money invested in new building, and in the lower part the number of square feet represented by new construction. Building construction is divided into four general classes, permitting the relative importance of each field to be visualized, while the total of each monthly column shows the entire volume of investment.

MONTHLY TREND OF BUILDING COSTS

Under this heading will be found each month a discussion of the trend of building costs which provides information as to the various important factors affecting its upward or downward course. Items of information as to cubic foot costs and other data of importance will be found here.

DURING the months of April and May the costs of building continued sharply upward. This was due to the pressure of demand resulting from the greatest building boom the country has ever seen. Early in June it seemed that a point of stabilization had been reached, which would probably be followed by a gradual decrease in cost.

The unusual conditions which have controlled the building situation during the last three months have rendered more and more difficult the problem of obtaining dependable general building costs. Reports which are being received in this office indicate a variation in cubic foot costs covering a range of from 20 to 30 cents on large buildings, and from 5 to 10 cents a cubic foot on residential and smaller structures.

To those who are interested in residential construction it should prove interesting to consider these cost figures developed late in May in the metropolitan area of New York. The figures are based on actual costs, and were very carefully prepared by detailed estimating on a specific dwelling in various types of construction. After the figures were developed they were carefully checked with actual work under way, so they constitute a dependable series of cost for that district. These costs were developed under similar specifications for a well built moderate cost house, thoroughly equipped with modern plumbing and electrical equipment. The cost was estimated in the five types of construction outlined here, and after detailed estimates were made these cubic foot costs were determined:

1. Exterior walls of colonial siding, with suitable mouldings and facias, constructed under the requirements of good practice for frame construction.

10-in. colonial siding, 46¼ cents.

2. Brick veneer laid up with rough flush joints; air space between frame and brick; frame thoroughly covered with tar paper; brick anchored to frame with galvanized iron clips; angle irons to carry lintels over doors and windows.

Brick veneer . . . . . 51⅓ cents.

3. In a floated, stippled or dash-coated stucco, in color tone to suit; stucco on galvanized wire lath; framing substantially covered with tar paper to insulate from any possible dampness.

Stucco on frame . . . . . 47 cents.

4. Of 8-inch terra cotta blocks, laid up in cement mortar with reinforced lintels over windows and doors. Interior furred for lathing and plaster; stucco finish in color to suit; stipple, float, dash, or Italian rough finish.

8-inch terra cotta blocks with stucco finish . . . . . 50⅔ cents.

5. Of solid 8-inch brick walls, laid up in either English, Flemish or garden bond, rough flush joint; iron lintels over doors and windows; furred interior walls for lath and plaster.

8-in. solid brick walls, $53\frac{1}{10}$ cents.

It is quite evident that at least a part of the unusual demand for building materials has been artificially stimulated under large advance orders for projects which have since been withdrawn from the market and by a program of overbuying by contractors in order to be certain of deliveries sufficient to carry out contracts. As these items are eliminated a large flow of materials is diverted to other work. In general, shipping conditions are much better than they were a few months ago, and it is noted in many instances that consignments are being received before the time promised. It is probable that by September it will be possible to develop for various types of construction general cubic foot costs which may be used with some degree of safety as a basis of estimating costs for new building projects.

BUILDING MATERIAL PRICES

Table Showing Average Prices Paid by Contractors for Building Materials at Local Distributing Points as of May 1, 1923. Prepared by Division of Building and Housing of the Department of Commerce from Prices Secured through the Bureau of Census

Commodity	Size or Condition	Unit	Mass. Fitchburg	Mass. Haverhill	Conn. New London	Va. Richmond	Penn. Pittsburgh	Penn. Erie	W. Va. Fairmont	S. C. Columbia	Md. Baltimore	Ga. Savannah	Mich. Detroit	Mich. Pontiac	Mich. Saginaw	Ore. Portland	N. D. Grand Forks	Iowa Waterloo	Mo. Kansas City	Mo. St. Louis
Common Brick		1,000	$24.00	$24.00	$30.00	$19.00	$18.00	$16.75	$24.00	$12.50	$20.00	$17.50	$17.50	$16.00	$18.00	$22.00	$15.00	$15.20	$16.50	$18.50
Portland Cement	Excl. of containers	Bbl.	3.25	3.40	3.68	3.15	3.10	3.40	2.85	4.00	3.50	3.85	3.72	.....	3.10	3.40	4.00	3.15	2.90	2.85
Yellow Pine No. 1	Dimension 2x4-16' S1S1E	M	80.00	56.00	55.00	32.00	55.00	52.00	.....	.....	40.00	30.00	50.00	50.00	58.00	.....	.....	52.00	54.00	45.00
Douglas Fir No. 1	Dimension 2x4-16' S1S1E	M	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	50.00	.....	58.00	24.00	50.00	50.00	54.00	47.50
N. Carolina Pine No. 1	Dimension 2x4-16' S1S1E	M	.....	.....	55.00	.....	.....	52.00	53.00	25.00	.....	30.00	.....	.....	.....	.....	.....	.....	54.00	.....
Common Boards No. 1	1x6	M	55.00	45.00	45.00	45.00	54.00	51.00	51.00	30.00	.....	.....	50.00	50.00	70.00	24.00	50.00	46.00	60.00	52.00
Y. P. Flooring E. G. "C"	1x4-10'-16'	M	130.00	92.00	110.00	125.00	83.00	.....	112.00	100.00	95.00	.....	.....	75.00	110.00	.....	.....	97.00	85.00	89.00
Douglas Fir V. G. No. 2	1x4-10'-16'	M	.....	.....	.....	.....	.....	112.00	.....	.....	.....	.....	.....	.....	.....	57.00	.....	97.00	75.00	.....
Red Cedar Shingles	Extra clear 16" 5 to 2	100 sq. ft.	8.75	6.50	6.00	.....	6.00	6.00	7.25	.....	11.20	.....	7.00	7.00	7.00	5.00	6.00	6.50	6.50	6.40
Cypress Shingles	Extra clear 16" 5 to 2	100 sq. ft.	.....	.....	.....	.....	.....	.....	.....	.....	.....	7.60	.....	.....	.....	.....	.....	.....	.....	.....
Composition Shingles	Crushed slate surfaced	100 sq. ft.	.....	7.50	7.50	7.50	6.50	6.50	6.25	7.00	6.00	6.50	6.50	7.00	6.50	.....	8.00	7.50	6.00	6.40
Gypsum Plaster Board	3/8"	1,000 sq. ft.	31.25	40.00	50.00	35.00	37.50	45.00	32.00	35.00	43.75	40.00	.....	40.00	45.00	.....	65.00	36.00	32.50	44.00
Lime	Hyd. Com.	Ton	24.00	21.00	24.00	22.80	23.00	20.00	16.00	20.00	17.25	22.50	20.00	16.00	15.00	26.00	.....	20.00	28.00	20.00
Building Sand		Cu. yd.	1.60	2.60	2.50	2.25	2.50	3.00	3.75	1.00	2.00	2.25	2.75	1.50	2.75	2.25	3.00	1.75	2.65	2.65
Crushed Stone	3/4"	Ton	3.25	3.00	3.50	.....	6.00	3.00	3.00	3.00	2.70	5.25	2.35	....	2.50	.....	.....	3.00	.....	.....
Window Glass	Single A 10"x12"	50 sq. ft.	5.10	4.75	.....	5.80	5.95	.....	4.90	4.85	4.80	.....	5.00	.....	4.50	.....	.....	5.25	.....	4.50
Hollow Tile	8"x12"x12"	Each	.30	.30	.....	.23	.21	.19	.26	.19	.24	.....	.18	.18	.17	.15	.....	.17	.18	.....
Cast Iron Soil Pipe	4" E.H. 13 lbs. per ft.	Ton	.....	.....	.....	.....	.....	.....	85.00	.....	82.60	.....	.....	81.62	97.00	112.42	91.20	85.00	.....	.....
Steel Pipe	1" galv.	100 ft.	.....	.....	.....	.....	9.86	.....	10.50	11.46	10.10	9.46	.....	9.00	9.99	16.50	10.50	10.00	.....	.....
Reinforcement Bars	3/4" square	100 lbs.	.....	4.50	.....	3.75	4.00	.....	3.50	4.50	3.40	5.00	4.00	3.50	4.00	4.00	5.40	3.80	.....	.....
Structural Steel	Fab. 6" I-beams	100 lbs.	5.00	6.00	.....	4.50	3.25	.....	6.00	4.50	3.40	5.00	.....	4.50	4.50	.....	5.40	5.00	.....	.....
Gypsum Plaster	Neat	Ton	24.00	26.00	26.00	.....	22.00	24.00	19.00	20.00	21.50	22.50	.....	17.00	17.00	24.00	27.00	18.00	18.00	18.00
Roofing Slate	No. 1 Ribbon	100 sq. ft.	.....	.....	.....	13.50	13.50	.....	12.75	.....	.....	.....	.....	17.00	.....	30.00	.....	18.00	.....	.....
Tar Paper Roofing	2-ply 75 lbs. per roll of	100 sq. ft.	.....	.....	.....	.....	1.95	.....	.....	.....	2.75	1.90	2.75	2.75	2.50	1.50	3.00	3.25	.....	.....
Rosin Sized Sheathing	3-ply 30 lbs. per roll of	500 sq. ft.	.....	1.60	1.60	1.50	1.35	1.30	1.25	.....	1.45	1.00	.95	1.00	1.20	1.80	1.75	1.50	1.20	1..25

Commodity	Size or Condition	Unit	Ohio Cleveland	Ohio Akron	Ohio Toledo	Ohio Lorain	Ohio Mansfield	Ohio Dayton	Ohio Hamilton	New York Buffalo	New York Rochester	La. New Orleans	La. Shreveport	Texas San Antonio	Ariz. Tucson	Wash. Tacoma	Wash. Spokane	S. D. Sioux Falls	Calif. Sacramento	Calif. Los Angeles
Common Brick		1,000	$16.00	$18.00	.....	$23.00	$20.00	$18.00	$24.00	$22.12	$17.75	$17.75	$15.00	$17.00	$15.00	$6.00	$18.00	$18.00	$17.00	$15.00
Portland Cement	Excl. of containers	Bbl.	3.48	3.50	$3.68	3.60	.....	3.60	3.20	3.03	3.35	3.60	3.40	3.60	4.40	13.40	3.38	3.86	3.55	3.26
Yellow Pine No. 1	Dimension 2x4-16' S1S1E	M	60.00	50.00	51.00	55.00	55.00	57.50	53.00	49.00	48.00	45.00	48.00	57.00	.....	.....	.....	.....	.....	.....
Douglas Fir No. 1	Dimension 2x4-16' S1S1E	M	.....	.....	.....	.....	.....	.....	.....	55.00	.....	.....	.....	.....	65.00	29.00	32.00	51.50	46.50	48.00
N. Carolina Pine No. 1	Dimension 2x4-16' S1S1E	M	.....	.....	.....	.....	.....	52.50	.....	.....	48.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
Common Boards No. 1	1x6	M	52.00	50.00	.....	50.00	50.00	70.00	75.00	45.00	45.00	48.00	60.00	66.00	62.50	29.00	31.00	46.00	48.00	48.00
Y. P. Flooring E. G. "C"	1x4-10'-16'	M	102.00	.....	100.00	110.00	84.00	.....	90.00	72.00	130.00	85.00	112.00	120.00	.....	.....	80.00	.....	.....	.....
Douglas Fir V. G. No. 2	1x4-10'-16'	M	.....	.....	.....	.....	.....	.....	.....	105.00	.....	.....	.....	.....	100.00	60.00	.....	83.00	83.50	87.75
Red Cedar Shingles	Extra clear 16" 5 to 2	100 sq. ft.	6.00	6.00	6.20	6.40	6.40	6.20	6.40	6.00	6.25	.....	6.30	6.80	.....	4.00	.....	5.60	5.65	5.88
Cypress Shingles	Extra clear 16" 5 to 2	100 sq. ft.	.....	.....	.....	.....	.....	6.50	.....	.....	.....	.....	7.65	8.00	7.00	.....	.....	.....	.....	.....
Composition Shingles	Crushed slate surfaced	100 sq. ft.	6.25	.....	6.75	.....	.....	6.50	7.00	.....	.....	6.00	6.30	9.00	.....	.....	.....	7.50	6.50	.....
Gypsum Plaster Board	3/8"	1,000 sq. ft.	32.00	27.60	.....	.....	32.00	50.00	.....	45.00	30.00	45.00	40.00	.....	.....	45.00	.....	32.00	41.50	45.00
Lime	Hyd. Com.	Ton	18.00	20.00	20.00	18.00	16.50	15.20	20.00	16.00	21.00	.....	30.00	18.00	23.00	23.00	.....	24.00	29.50	25.00
Building Sand		Cu. yd.	2.50	1.90	3.03	2.50	1.60	2.00	1.90	1.28	2.25	2.00	2.25	2.25	1.15	1.25	.....	1.50	1.50	1.60
Crushed Stone	3/4"	Ton	3.50	3.25	3.00	2.60	1.70	2.00	1.50	1.30	2.25	.....	5.40	2.00	3.00	1.50	.....	3.00	2.75	2.15
Window Glass	Single A 10"x12"	50 sq. ft.	.....	5.40	.....	.....	.....	4.50	6.50	4.20	4.20	4.50	4.50	4.20	.....	.....	4.86	4.50	4.52	5.10
Hollow Tile	8"x12"x12"	Each	.....	.19	.....	.21	.17	.21	.20	.22	.21	.22	.22	.25	.18	.....	.....	.17	.....	.18
Cast Iron Soil Pipe	4" E.H. 13 lbs. per ft.	Ton	.....	95.75	.....	.....	.....	110.88	100.10	.....	.....	88.00	93.95	120.00	.....	.....	.....	.....	.....	.....
Steel Pipe	1" galv.	100 ft.	.....	11.49	.....	.....	.....	10.57	10.38	10.00	10.52	12.58	11.95	11.12	13.25	.....	13.14	.....	.....	12.30
Reinforcement Bars	3/4" square	100 lbs.	.....	3.85	.....	3.30	.....	6.00	3.75	.....	3.60	3.50	4.00	4.15	.....	4.00	.....	.....	.....	3.55
Structural Steel	Fab. 6" I-beams	100 lbs.	.....	3.50	.....	3.95	.....	.....	4.75	.....	4.50	3.90	6.00	4.50	.....	4.50	.....	.....	.....	.....
Gypsum Plaster	Neat	Ton	.....	19.00	.....	19.20	18.20	18.00	18.50	17.00	18.00	22.00	24.00	24.00	21.00	.....	20.00	.....	.....	.....
Roofing Slate	No. 1 Ribbon	100 sq. ft.	.....	12.40	.....	.....	.....	15.00	18.00	.....	.....	14.00	12.00	18.00	.....	.....	.....	.....	.....	.....
Tar Paper Roofing	2-ply 75 lbs. per roll of	100 sq. ft.	2.50	2.80	.....	.....	.....	1.80	2.00	2.00	1.80	2.25	2.50	3.50	2.90	.....	2.82	3.00	.....	2.25
Rosin Sized Sheathing	3-ply 30 lbs. per roll of	500 sq. ft.	.90	.95	.....	.....	.....	.....	1.25	1.50	1.50	1.75	1.75	2.25	1.75	.....	1.22	1.30	1.00	1.50

THE FORUM CONSULTATION COMMITTEE

A group of nationally known experts on various technical subjects allied to building, providing a direct service to architects

THE editors of THE ARCHITECTURAL FORUM have been fortunate in obtaining the co-operation of the following recognized experts who constitute THE FORUM Consultation Committee. This Committee provides a service of the greatest value to subscribers in addition to the usual editorial service, and architects who seek information on specific questions in these various fields are invited to present inquiries.

The basis on which this Committee has been organized is:

(*a*) That each committee member shall be a representative leader in his line;
(*b*) That no committee member has affiliations with any manufacturer;
(*c*) That no committee member will be called upon for detailed service excepting by special arrangement;
(*d*) That a special editorial article on a subject represented under each of the headings below shall be prepared during the year by the committee member.

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FREDERICK WALTER IVES, B.S., M.E.

Professor and Head of Department of Agricultural Engineering, Ohio State University. Consulting Agricultural Engineer, Columbus, Ohio.

Specialist in land drainage, soil improvement, surveys, farm arrangement for economical production, purchase of equipment and economical layout of farm buildings with special reference to interior arrangement.

Address inquiries to committee members, care THE ARCHITECTURAL FORUM, 103 Park avenue, New York

THE FORUM DIGEST

A SURVEY OF IMPORTANT CURRENT ARTICLES ON BUILDING ECONOMICS AND BUSINESS CONDITIONS AFFECTING CONSTRUCTION

The Editors of this Department select from a wide range of publications matter of definite interest to Architects which would otherwise be available only through laborious effort

IMPORTANT DECISIONS BY NATIONAL BOARD OF JURISDICTIONAL BOARDS

AT this time when there are so many disputes between building trades employers and various branches of union labor regarding jurisdiction, it is of interest to report these awards by the National Board:

Corrugated Sheeting

"The erection of corrugated metal sheeting on steel frame constructions when the sheets are simply end and side lapped, is the work of the iron workers; the erection of all other corrugated metal sheeting, of No. 10 gauge or lighter, is the work of the sheet metal workers."

Derricks, Erection and Handling for Setting Stone

"The stone setter shall have sole jurisdiction over hand derricks in connection with the setting of stone. The erection and operation of power derricks for setting stone shall be done by the iron workers under the direct supervision of the stone setter, who shall determine the number of men to be employed."

Artificial Stone-Granite, Pressing, Altering and Finishing

"In the matter of dispute between the Granite Cutters' International Association and the Journeymen Stone Cutters' Association relative to artificial stone, the dressing, altering and finishing of artificial stone, cast in imitation of natural stone is the work of the Journeymen Stone Cutters' Association except that when any such artificial stone, by reason of hardness or texture, requires the use of granite cutters' tools for the proper dressing, altering or finishing it is the work of the Granite Cutters' International Association."

Hollow Metal Window Frames and Sash

"A request for a rehearing was presented by the sheet metal workers, of that part of the board's decision referring to the so-called Campbell Sash and Window, which had been awarded to the iron workers. It was stated that the window was now being made of lighter material. Action was deferred until the next meeting of the board and all parties are to be notified to be present and present evidence in the matter."

Vitrolite and Similar Opaque Glass

"At the request of the painters a rehearing was granted and evidence submitted by the bricklayers, representing the marble setters, and the painters, representing the glaziers. The board in executive session decided to supplement its decision of March 11, 1920, with this ruling:

"It is the opinion of the board that the decision of March 11, 1920, is intended to convey to the Bricklayers, Masons and Plasterers' International Union all counters and lavatories constructed of vitrolite or carrara glass and such glass when used in mural decorations on buildings in place of marble or other stone or used in conjunction with marble or other stone as panels on counters.

"It is the further opinion of the board that the decision is intended to convey all vitrolite, opalite, white opal and other opaque glass installed on false work or furring strips secured with screw rosettes, moulding, putty, screws, expansion or toggle bolts, on walls, ceilings, partitions or columns to the Brotherhood of Painters, Decorators or Paperhangers of America.

"The agreement of December 5, 1910, which was concurred in by the board of awards on July 12, 1922, remains in effect, and any disputes that may arise in connection with the subject of the agreement and the board's decisions shall be adjusted in accordance with the provisions contained in Sections 3 and 4 of the agreement."

Electrical Work on Elevators

The electrical contractors requested an interpretation of the decision of the board regarding the installation of feed wires to controllers. The contention arose over the installation of new controlling devices. The elevator constructors insisted that the devices were not part of the feed wire system while the electrical workers claimed that they come within their version of the decision.

The board in executive session decided: "That the work in dispute seemed to be covered by the present decision and it is the decision of the board that the work belongs to the elevator constructor."

Erection of Conduo Base

Conduo base is a new form of metal base with raceways for the insertion of wiring from which any number of outlets may be made and electrical connections provided in any part of a room by removing the face from the base.

The electrical workers contended that it was solely for the use of their wiring and that only an electrical worker could install it and make it safe electrically and commercially profitable to those using it. The sheet metal workers claimed that it was purely a metal trim base and that it could only be installed properly by mechanics in their trade. After a three-hour hearing of the evidence in the matter the board decided to defer its decision until the next meeting

Jurisdiction Over Cork Insulation and Substitutes Therefor

"The board having been informed that the several parties to the agreement of May 1, 1918, relative to the erection and installation of cork and other insulations as substitutes have not, as suggested by the board, renewed that agreement, and it being contended by some of the subscribers to the agreement that it has been automatically abrogated so that no understanding is now in effect, this decision is rendered without prejudice to any of the parties if circumstances make any further consideration of the matter necessary or desirable. *Decision:* In the matter of the erection and installation of cork and other insulations used as substitutes the United Brotherhood of Carpenters and Joiners of America shall control all cork and other substitutes when laid dry, such as floors, partitions and ceiling insulation, including the cutting and fitting thereof; the Operative Plasterers and Cement Finishers' International Association and the Bricklayers, Masons and Plasterers' International Union shall jointly control all cork and substitutes therefor when cement or other plaster materials are used, including the cutting and fitting thereof; on all jobs of cork laid in asphalt, it shall be permissible for the laborer to do the work of smearing the asphalt, under the supervision of the mechanic."

Flat-Faced Tile

This agreement was entered into on February 21, 1911, and amended May 26, 1923, by and between duly accredited representatives of the bricklayers and the slate and tile roofers:

"Jurisdiction is hereby conceded the Bricklayers, Masons and Plasterers' International Union over the laying or setting of flat-faced tile of every description when laid in mortars on all flat roofs or promenade roofs.

"Jurisdiction is hereby conceded the Slate and Tile Roofers' International Union over flat-faced tile of every description, and corrugated tile, when laid

in any preparation of asphalt on roofs, flat or otherwise.

"On motion the foregoing agreement was concurred in and declared to be the decision of the board."

SAFETY CODE ON WALKWAY SURFACES

A CONFERENCE attended by 63 representatives of trade associations, technical societies, safety organizations, and government departments, held in the Engineering Societies Building in New York early this year, declared by unanimous vote "That it is desirable to have a nationally uniform safety code on walkway surfaces," and that the development of this code should be carried out under the procedure of the American Engineering Standards Committee.

The conference voted to include in the code these places: elevator floors; elevator landings; corridor floors; ramps; runway floors (subject to interpretation by the sectional committee which will prepare the code); stair treads and landings; fire escape treads and landings; floors round machinery and at door thresholds, and sidewalk hazards such as coal hole covers and sidewalk doors. It was recommended that the sectional committee consider the questions of platforms in front of electrical apparatus, especially switchboards, and floors around machinery in motion, as to insulation and non-slip qualities. This new code will apply to apartment houses, factories, and other working places, office buildings, hospitals, hotels, and restaurants, railway cars, railway stations and train platforms, schools and theaters.

On the motion of Lieut. Glenn H. Easton, of the Construction Corps, U. S. Navy, it was voted to recommend that the A. E. S. C. take steps to determine whether it is the desire of all shipping interests that deck and other walkway surfaces of ships should be included in the work. The conference voted that the performance characteristics which should be considered in walkway surfaces are: resistance to slipping; durability; freedom from the tripping hazard, and flammability. General and maintenance requirements will also be included in the code.

Sullivan W. Jones, representing the American Institute of Architects, said that there is at present no standard of what constitutes a safe floor, and that the A. I. A. was, therefore, very strongly in favor of the preparation of such a code. Sidney J. Williams, chief engineer of the National Safety Council, acted as chairman of the conference. Following the conference, the manufacturers' representatives met and appointed a committee, under the chairmanship of H. W. Mowery, to arrange for representation in the continuing work, of manufacturers of the various classes of floors and floor coverings, in view of the fact that several of these classes of materials are not covered in any trade association.

The next steps in the development of this code will be the appointment of sponsors by the American Engineering Standards Committee and the organization of a sectional committee which will draft the code. This sectional committee will be composed of official representatives of all organizations concerned with the subject of safe walkway surfaces, either as producers, consumers, casualty underwriters, or governmental officials representing the general public.

NEW SCHOOLS TEACHING BRICKLAYERS

ANYTHING which tends to increase the number of workmen in the building trades contributes to the advantage of the building fraternity, therefore we are particularly interested in a clipping from a recent issue of the New York *Times*, which we quote.

"The recent strike of bricklayers has served to focus attention on the problem of the shortage of bricklayers, and reports have come to local contractors and the Mason Builders' Association of the establishment of trade schools in various parts of the country for the training of artisans to remedy the shortage of skilled men in the building trades.

"San Francisco, St. Paul and Minneapolis have begun schools from funds raised by subscription among contractors and others interested in the building trades. It has been charged by the contractors that due to rigid rules the bricklayers' union and other organizations in the building trades have limited the number of apprentices.

"One way to avoid high construction costs has been found by the general contractors of St. Paul and Minneapolis. Two years ago they raised a fund of $6,000 and rented a building midway between the two cities and hired a competent bricklayer to give instruction."

The theory of training men in this way has proved a success and the school has prospered, according to A. V. Williams, Secretary of the St. Paul Builders' Exchange; writing of the school's progress in the current issue of *American Industries*. He says:

"It has fully met the expectations of the most optimistic of its promoters and is now a permanent Minnesota institution.

"The purpose of the school is to train men in the bricklaying trade, so that the shortage of mechanics in that trade of about 33 1-3 per cent could be relieved, and an adequate number of men enter that trade each year. The United States Government Census Report for 1920 shows that there were 26.3 per cent fewer mechanics working at the bricklaying trade in 1920 than there were in 1910.

Union Set 21 as Age Limit

"Comparatively few men have entered the bricklaying trade during the past fifteen years, due largely to the restrictions imposed on apprenticeship by bricklayers' unions throughout the United States, among which are that no one over 21 years of age would be permitted to learn that trade; that those who were allowed to enter the trade be required to serve an apprenticeship of three years, and the limiting of the quota of apprentices who could enter the trade to a certain number for each contractor."

PROBLEMS OF THEATER VENTILATION

THIS interesting data is from an article which recently appeared in *The Heating and Ventilating Magazine:*

"Among the schemes for ventilating a theater building presented at a recent meeting of the Illinois Chapter of the A. S. H. & V. E., was one by E. P. Heckel of the Carrier Engineering Corporation.

"As reported in *Power Plant Engineering* for April 15, this scheme dealt largely with the system of downward introduction of the air as opposed to the conventional mushroom method. He considered also quantities involved to secure certain desirable weather conditions. Quoting from the paper, the report continues:

"Ventilation of the theater, or any other enclosure, is in itself a comparatively simple problem if you consider ventilation merely a matter of displacing theater air with a large or small volume of outside air by mechanical means. The cooling of a theater is also rather simple when incorporated with ventilation and when theater temperatures (dry-bulb alone) are considered without respect to relative humidities or resultant wet-bulb temperatures, or when the economical operation of the theater refrigeration and ventilation system is considered a matter of no real importance.

"Broadly speaking, what is to be considered when we think of theater ventilation and cooling? That subject in itself represents money spent for mechanical equipment for the assurance of the comfort of the patrons while in the theater. I believe we should consider of paramount importance all of the following factors, any two of which, if omitted in such consideration, would not permit maximum comfort conditions commensurate with economy in the operation of such equipment. We like to think of theater ventilation and cooling as comprising:

1. Maintaining dry-bulb temperatures in the theater with some respect to outdoor temperatures.
2. Maintaining a uniform wet-bulb temperature with respect to the dry-bulb temperature.
3. Providing good air circulation, or air movement.
4. Providing proper air distribution to promote uniformity of air delivery without objectionable drafts and without subjecting the patrons to either warm or cold saturated air, to their discomfort.
5. Maintaining purity of air in circulation.

Objections to Upward Ventilation through Mushrooms

"Some objectionable features of the conventional method of air distribution, namely, the mushroom method, might be enumerated:

1. A system designed to deliver air directly underneath the seats from the

cooling apparatus, whether it be from a spray type dehumidifier or bunker coils, without a recirculating air mixture or means of re-heating, proves objectionable in that saturated air is delivered under the seats with temperatures that may range anywhere from 50 to 65° during the refrigeration period.

2. Difficulty is involved in getting a uniform distribution of air delivery since low duct velocities are necessary in the supply, and practically the only means for regulation or varying the quantity discharge by the different mushrooms is by the adjustment of the mushrooms themselves. In adjusting the mushrooms, varying the sizes of discharge openings, varies the velocities from the various mushrooms. Even though the volume of air may be varied, the results are obviously uncertain.

3. The mushroom delivery method has one objectionable feature which it may be considered important to eliminate. I question if any of us would refuse to recognize the fact that air delivered directly on the floor level in a horizontal plane disturbs the floor dust and keeps it in more or less constant circulation.

4. With the mushroom delivery method, the temperature and humidity regulation is not as easily obtainable and positive as we believe it should be.

"Air conditioning in the past has been directed largely to industrial lines where the requirements for definite and uniform temperature and humidity conditions are infinitely more exacting than with theater cooling and ventilation, although relatively not more important. Why not profit from that experience? I believe I am correct in saying that in no case do we deliver air at floor level.

Mushroom Exhaustion Advocated

"Of extreme importance, as I see it, is air distribution, but it is also necessary that the design of the apparatus be of proper proportion for specific temperatures and humidities with a simple yet positive means for control of both. I therefore prefer, wherever practical, the downward method of air delivery which reverses the conventional method of mushroom delivery to the method of mushroom exhaustion. The principal advantages of the overhead method, I believe, can be enumerated thus:

1. Uniformity in air distribution as well as distribution of temperature and humidity, obviating objectionable drafts, which, by the overhead method, I believe, are more easily obtained.

2. The downward flow of air has the advantage of permitting the cool air delivered to be tempered before it reaches the breathing zone, and this air comes direct to the occupants.

3. It permits of flexibility in operation, whether one or more units are used, by splitting up the theater into separate air delivery zones, as well as separate air exhaust zones, each zone being taken care of independent of the other.

4. If the rear of the house is unoccupied, the apparatus for that particular portion need not be in operation. This applies to any other portion of the house as well.

5. It permits closer regulation of temperatures and humidities, as the automatic regulators are then placed in the exhaust or return air duct which air temperatures will give the average breathing zone conditions which, after all, is what we are interested in.

A Case in Point

"Let us assume that we want to hold the theater conditions at 80° maximum temperature when outside is at a maximum of 95°. The theater humidity conditions to be held at 55 per cent relative humidity, with wet-bulb temperatures not exceeding 68°. This means a moisture content in theater air of not more than 6.93 gr. per cubic foot, and which determines the dewpoint temperature of room air to be 62°. This fixes one condition and consideration that cannot be changed, and that is—regardless of the volume of air passed through the cooling apparatus and regardless of the type of cooling apparatus, that air passed through the cooling equipment must be cooled to at least a temperature of 62° before it is delivered to the theater. Why? Because it is necessary, first, to fix the moisture content of the air so that when this air heats up to 80° (the theater temperature selected), the moisture contained by the air will be 55 per cent of the amount that air at 80° could hold, if saturated with moisture. Air at 80°, if saturated, would hold 10.934 gr. per cubic foot. Since we want 55 per cent relative humidity, the actual moisture contained in the 80° air must be 55 per cent of 10.934, or 6.02 gr. To obtain this condition necessitates cooling the air and condensing out the excessive moisture contained in the entering air, down to 62°, at which saturated temperature the air will hold only the requisite moisture necessary.

"We are considering a 2,000-seat house. How much air is to be delivered? How much is to be cooled? We know that regardless of what volume we select, we must cool the air passing through the dehumidifier to at least 62°. Some say 25 c.f.m. per occupant, all from outdoors. This would mean 50,000 c.f.m. cooled to 62°. What does this mean in refrigeration load? What is the B.t.u. load to be absorbed from this air that is being cooled? What will be the resultant theater conditions?

"Heat to be absorbed in the theater by the delivered air is 10,000 B.t.u. per minute with a full house (5 B.t.u. per minute per person). Therefore—

10,000 B.t.u. × 56 ÷ 50,000 c.f.m. results in a rise in temperature to the delivered air of 11.2° in absorbing the liberated heat from occupants, walls, lights, etc. It can't rise any more unless we furnish additional heat from some other source. If we don't get this other heat, what is the result in the theater? We first cooled to 62° (saturated)—that was necessary. The rise in air temperature in the room is only 11.2°. The theater temperature will then be 62° plus 11.2°, or 73.2°. What else have we? A relative humidity of 70 per cent with a wet-bulb of 66°.

"Is it not reasonable to believe that a temperature of 73.2° in the house, when outside is at a maximum of, say, 95°, is too low to be comfortable? Most of us would probably say the temperature would be more comfortable if the house were 80°. An additional 6.8° rise in temperature, with the same dewpoint, would reduce the relative humidity to the 55 per cent that we previously specified as desirable. The wet-bulb with 80° dry-bulb and the same 62° dewpoint would be 68°, or only 2° higher than at 73.2° room dry-bulb temperature.

The Refrigeration Required

"Now, what about the refrigeration required?

50,000 c.f.m. ÷ 13.4 = 3,735 lbs. air per min.
Total heat at 78° 40.5
Total heat at 62° 27.3
13.2 B.t.u. per pound
13.2 B.t.u. × 3735 = 49,250 B.t.u.
Pump 15 h.p. × 42.5 = 637
Total 49,887 B.t.u.

To cool 50,000 c.f.m. from a maximum outside condition of 78° wet-bulb to 62° saturated, would require 250 tons of refrigeration.

"Some of us will say that this is too much refrigeration for this 2,000-seat house. The fact remains, however, that if you have to cool 50,000 c.f.m. from maximum outside conditions to 62°, you can't get away from using 249.5 tons. If you use less refrigeration, you simply don't cool 50,000 c.f.m. to 62° under extreme maximum outside conditions, unless you wanted to use a heat interchanger, which is not the most practical thing for theater work, and if you do not cool to at least 62° the air will contain more moisture and will result in a higher relative humidity and higher wet-bulb temperature than we are considering.

"How can we avoid this high refrigeration load, as well as the heating necessary at the same time and still be able to say that the theater temperature will not exceed 80° on the hottest day of the summer, and the relative humidity and wet-bulb will not exceed 55 per cent and 68° respectively, regardless of outside maximum conditions?

"It is nothing short of wasteful to spend money and equipment and power for its operation, to cool air and condense moisture from large volumes of air, and then exhausting it immediately to outdoors. Why not recirculate a portion of it at least? This procedure, I cannot believe, promotes the hazardous condition, resulting in all sorts of ailments and sicknesses to mankind, that some few in the past have tried to make us believe, but I do know that it does promote economy in plant equipment, size and operation, and gives the desired temperature and humidity conditions as well as air movement in the theater for comfort.

The Same Problem Considered with Partially Recirculated Air

"Considering the same theater temperature and humidity desired as heretofore, let us see what happens if we use a total fan capacity of 60,000 c.f.m. dehumidifying and cooling 40 per cent and recirculating 60 per cent. Since we are now recirculating some air, we must cool

the outside air taken in to a lower dewpoint or saturated temperature to compensate for moisture given off by the theater occupants. Calculations indicate that we must cool to 57°. This cooled air, mixed with recirculated air at 80°, gives us a temperature of mixture of 70.65°. This, then, would be the delivery temperature to the theater. In taking up the heat given off by theater occupants, lights walls, etc., this 60,000 c.f.m. of air delivered will rise 9.35°, giving 80° as the final breathing zone, exhaust or recirculated air temperature.

"Refrigeration required to maintain the theater temperatures would not exceed 150 tons with this arrangement. A comparison of figures shows:

"This represents a saving of 100 tons of refrigeration. Assuming for a moment the power consumption of 1 h.p. per ton of refrigeration, in each case it also represents a total of 100 h.p. saved. Assuming 2 gallons of water required per ton of work done for condensing purposes would indicate a saving of 200 gallons of condensing water in favor of a system embodying recirculation. Allowing the same temperature water rise in the spray cooling system in either case, indicates a saving in the quantity of spray water necessary, in favor of the recirculating system of over 240 gallons of water. Since this water is recirculated, the saving by the reduced quantity of water necessary amounts to about 10 h.p. in the motor for the pump. Is not the 100-ton reduction in refrigeration size, 100-h.p. reduced operating cost, 200 gallons per min. of condensing water and the 10-h.p. reduction in pump motor size well worth considering?

"I am inclined to believe that I would advocate the downward method of air delivery whenever conditions permit. Often, the owners and the architects have already proceeded with the mushroom method of air delivery in mind, and the architects' layout is too far along to permit changing this method. Then the same recirculation idea could be followed out with the mushroom method of air delivery as with the downward method. In compromising (and engineering is full of that) this will give you some idea of the disadvantages set forth here, but will also embody some of the advantages considered possible by the downward method, due to the recirculation of air."

RESPECTIVE SERVICES OF ARCHITECT AND CONTRACTOR

THE Associated General Contractors of America in a recent bulletin have issued this statement regarding the relations of the architect and the contractor: "The performance of construction under the day labor plan by public officials who underestimate the value of a constructor's managerial function, combined with the tendency of constructors and designers to confuse their own respective functions, has indicated the need for a clean cut statement of what service each of these agencies should rightfully perform for their clients. Many controversies arising between them over the encroachment of one upon the other's field are believed to result from lack of a proper conception of what each has to contribute and the necessity for both in our economic scheme. A clear definition of their respective services therefore appears essential, and it is to develop such a definition that the accompanying statement of functions has been formulated by the Committee on Methods. "To insure that this statement of principles is both comprehensive and sound, it is being distributed for criticism and comment to chapters of the A. G. C. A further step will be to obtain an expression from engineers and architects, and eventually to produce a code of service for the industry. The Committee on Methods of the A. G. C. desires to obtain all possible suggestions relative to this subject, either favorable or adverse, which should be sent to the Washington office of the Association."

Declaration for Co-operation in Building

The Constructor	The Designer
Will insure completion of project.	1. Will design complete throughout, including structural design.
Will make quantity survey of plans.	2. Will permit ample time for bidding.
Will submit bids at stated time.	3. Will open bids in public.
Will bid freely in competition.	4. Will specify materials freely competitive.
Will base bid on his previous unit costs.	5. Will award work at the bid price.
Will submit evidence of responsibility	6. Will permit only responsible contractors to bid.
Will guarantee cost of the work shown on plans and specifications.	7. Will give complete information as to dimensions, quantity, quality and design.
Will warrant time of delivery of structure.	8. Will furnish detail plans without delay.
Will develop adequate financial credit	9. Will approve estimates promptly.
Will supply adequate construction equipment.	10. Will allow equipment rental on monthly estimates.
Will furnish ample tools.	11. Will furnish ample details.
Will furnish bond for faithful performance to owner.	12. Will fearlessly demand justice from the owner.
Will sign Joint Committee form of contract.	13. Will submit Joint Committee form of contract.
Will perform portions of work with his own construction force.	14. Will supervise work with his own force.
Will supply experienced superintendence.	15. Will supply practical supervisors.
Will protect owner against liens.	16. Will examine specified patented products for prescribed royalties.
Will insure owner against all accidents.	17. Will allow insurance premiums as part of actual costs.
Will be fair to subcontractors.	18. Will let general contractor award all subcontracts.
Will be always fair to labor.	19. Will make specifications clear for all divisions of work.
Will keep quality standards high.	20. Will arrange for inspection of materials at source.
Will guard public interest in labor rates and conditions of employment.	21. Will not urge continuance of work in case of strikes or lock-outs.
Will co-operate through local chapter of contractors.	22. Will assist the local chapter of architects.
Will display skill in construction methods.	23. Will be resourceful in design of structures.
Will through integrity inspire business confidence.	24. Will reward square dealing.
Will support rulings of National Board for Jurisdictional Awards.	25. Will specify in accordance with decisions of the National Board for Jurisdictional Awards.
Will be loyal to designers.	26. Will respect loyalty of constructors.
Will help train apprentices.	27. Will encourage young workmen.
Will assume responsibility for errors in construction.	28. Will assume responsibility for errors in design.
Will develop sound commercial practices.	29. Will permit arbitration as to dollars.
Will charge legitimate construction fees.	30. Will charge the A. I. A. designing fees.
Will shake hands with Designer upon receipt of final estimate,	31. Will pat Constructor on the back upon completion of the job.

then

the CONSTRUCTOR would not have time nor the trained professional technique to adequately design work,

the DESIGNER would not have time nor the experienced business organization to efficiently undertake construction work,

and

The Owner

would get the best possible construction service from Both.

"Modern construction embodies fine architectural symmetry and aesthetic design developed through past ages and now reared upon tested scientific engineering principles of strength and proportion of materials gathered throughout the world, stored for prompt delivery, fabricated in special shops, and speedily and economically erected with skillful methods by experienced artisans into a practical structure for a useful purpose."

BOOK DEPARTMENT

VILLAS OF FLORENCE AND TUSCANY. By Harold Donaldson Eberlein. 411 pp., 7½x11 ins. Lavishly illustrated; frontispiece in color; bound in cloth. Price $15. J. B. Lippincott Co., Philadelphia.

PERHAPS because the splendors of Italy are so many and so varied, our writers upon architectural subjects when treating of Italy have dwelt chiefly upon what is vast and magnificent; there has been to a great degree a general ignoring of what is of minor extent and of what writers have apparently supposed for that reason to be of minor interest.

And yet Italy, more than most countries of Europe, is literally filled with examples of architecture as well as of other arts which while not of the first magnitude and importance possess every element of abiding interest and perpetual charm. Because we have been led by many writers and travelers to consideration of the vast, we have ignored the fact that in Italy as in other European countries there have always existed what one might call dual presentations of architecture; one of these presentations is the magnificent and splendid, the architecture in which were built the palaces of royalty or those great mansions in town or country which were the houses of the high nobility and which stand as representative of their several architectural styles, while the other type is that in which were built the houses of the people themselves,—a manner of building which existed alongside the magnificent, opulent type without being influenced by it. To this minor class belong the largely forgotten manor houses or better class farmhouses of England and buildings of much the same classes in France and Spain, while Italy, as already suggested, is particularly rich in domestic buildings of minor size, the lesser villas, houses of the more prosperous farmers, homes in villages or small cities, and many old houses in remote, out of the way quarters of the larger cities where descendants of old families maintain a certain feudal isolation, wholly apart from present-day conditions.

This fascinating type of the domestic architecture of different countries of Europe is now receiving its due meed of praise. Books dealing with the lesser architecture of many lands are to the fore, stimulated by the recently awakened interest which Americans feel in architecture and decoration, and helped along not a little by the fact that buildings of this character supply models for American homes far more useful than the great villas and palaces. The era of the building of vast houses in America, exemplified by some of the "cottages" at Newport and exemplified even yet by the occasional building of a great house, seems to be largely a thing of the past. Country houses of even the very rich are now

THE DAVANZATI PALACE, FLORENCE

A Restored Palace of the XIV Century, Measured and Drawn, Together with Short Descriptive Text, by
LOUIS CONRAD ROSENBERG

THIS work is issued to provide for architects, decorators and students a volume of moderate cost on one of the old Florentine palaces, a building which abounds in suggestions readily adapted to present-day work. The Davanzati Palace is one of the most notable of the early Italian palaces and belongs to a period when Italian architecture excelled in simplicity, charm, and all the qualities which lead to its use today.

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MEASURED drawings of bases, columns, capitals, mouldings and corbels; mantels, ceilings, door and window trim, paneled doors and inner blinds or shutters; floors laid in tile or specially modeled Roman brick; wrought iron hinges, bolts, knockers, escutcheons, holders for flag poles or torches, and hooks for wall hangings. Measured drawings for polychrome ornament on plaster walls or wooden coffered ceilings or tabernacle doors, with descriptions of colors used.

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Published under the direction of the American Institute of Architects

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THE Committee on Education of the A.I.A. has produced this volume for use as a textbook in American colleges, and for general reading and study by the public, with the purpose of arousing interest in the fine arts and creating a better understanding and appreciation of them. The book is intended specifically to appeal to those who have heretofore taken but little interest in the arts, and have had no realization of the fact that the fine arts are for them and that these arts are already inseparably connected with their everyday lives.

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likely to be of an amplified farmhouse or minor villa type, and American architects have learned the secret of adapting architectural styles from many countries to the needs of an American clientele.

In this richly illustrated volume there are presented many of the villas and minor buildings of other domestic types which the author has selected from among the many which extensive travels in Italy have revealed. Of distinctly northern Italian types, the houses are chiefly those of the sixteenth and seventeenth centuries, some in the country, but many again in towns and cities. These buildings illustrate at its best the Italian faculty of securing symmetry and harmony, not only by using simple materials but also by using such materials for structures of comparatively small size. Even a small Italian villa or farmhouse often possesses a character and balanced dignity which generally belongs only to larger buildings.

The volume possesses a high degree of interest to architects by reason of the variety of buildings illustrated and described, and particularly to the inclusion of measured floor plans. The interiors as well as the exteriors are illustrated, and a study of the presentation of each building gives an idea which could hardly fail to be helpful to an architect planning modern work in the Italian style which is appropriate for American use.

OUTSIDE THE HOUSE BEAUTIFUL. By Henrietta C. Peabody. 70 pp., 9¼ x 12¼ ins. Price $3. The Atlantic Monthly Press, Boston.

IT is widely recognized that architecture of many kinds is powerfully affected by the surroundings amid which it is placed. The most beautiful of country cottages gains greatly in appearance when its setting is so disposed that it sets forth to the greatest advantage the good qualities of the structure, and often indeed half the beauty of a building is that contributed by its surroundings, and one recalls certain of the Italian villas and their marvelous gardens, and many old cottages in Surrey or Devonshire, or the English manor houses surrounded by their lawns and gardens with hedges of clipped yew, which aid immensely in securing the beauty of effect of the whole.

This intimate connection between architecture and all forms of gardening has been by no means overlooked in America, but during the last few years it has taken on a new interest and meaning, and certainly a wider application, for now when a house is built considerable effort is put forth—and much expense incurred—to create that harmony and dignity which generally come with age and growth,—but which Americans must have before even one brief season has elapsed!

This volume is a companion or a sequel to an earlier volume, "Inside the House Beautiful," and as that work dealt with the details which render beautiful the interior, so the present volume treats of Foundation Planting; Garden Beds and Borders; Hedges; Garden Paths; Walls and Fences; Vines; Pools and Fountains, and Garden Ornaments and Accessories. The work is profusely illustrated, and is calculated to considerably heighten the interest which any home owner naturally feels in its surroundings, while to architects it will be particularly useful, since architects as part of their practice must often supervise the laying out of grounds, and these illustrations afford many valuable suggestions regarding making the utmost of possibilities presented.

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THE first volume of this work, dealing with small and medium sized English houses in the Georgian style, met with an enthusiastic reception from American architects. This later volume possesses an even wider appeal, for the present vogue of the Georgian style, particularly in its simpler forms, renders the subject of vital interest not only to architects but to interior decorators as well.

In excellent half-tone plates, chiefly of full page size, there are illustrated different rooms of late Georgian houses,—halls, living rooms, libraries and dining rooms, and such details of interiors as mantels, door and window frames, stairways, columns and pilasters, and ornament in relief upon walls and ceilings. **An invaluable detail of the work is the inclusion of drawings from which many of these details can be reproduced.**

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ARCHITECTURAL COMPOSITION. By D. Varon. 36 pages of text and 40 plates of illustrations by the author. 9¾ x 12¼ ins. Price $6. William Helburn, Inc., New York.

TO what extent do architects, as a class, feel a sense of their responsibility? Much is being made today of the power of the printed word—the "power of the press," it is called—but little is being said of the power of architecture. Nevertheless, just as the printing press issues to the world the work of the writer, the work of the architect is laid before the world in the form of buildings,—structures which by their sincerity and integrity or else by their falsity and sham may be almost as potent in a subconscious way in influencing those who come in contact with them as the printed words which it is agreed are so powerful. Many communities have been encouraged on the road to falsehood and make-believe through the work of their thinkers, among them the architects. If these men, acknowledged to be leaders of taste, think it harmless to use sham materials or to imitate costly marble and granite in the erection of public buildings, how can they be surprised if the laity follow their example and, regarding shrewdness as a virtue, resort to other forms of sham which when added together and multiplied many times result in the colossal hypocrisy which characterizes so much in American life? The architect might well regard himself as thinker, preacher and doctor, all in one; through the artistic merit of his work he can aid powerfully to reform, uplift and cure, and all this he does when he is true to his art and to himself.

One highly important factor in architecture is the influence of the design, which impresses a beholder even before there arises the consideration of the sincerity or falsity of structural materials. It is not difficult to call to mind buildings which by their excellence of design create in the mind even of one who knows little of architecture a feeling of satisfaction,—an intuitive knowledge that here is a structure which is well designed and appropriate for its function; and no less easy is it to recall other buildings which by their restlessness or incoherence of design convey a feeling equally strong that here an opportunity has been neglected, and that what might have been a structure powerful for its influence in uplifting has become a building which is calculated to further confuse public appreciation.

In this volume Mr. Varon, a former professor of architecture at Syracuse University and also at the University of Illinois, and author of "Indication in Architectural Design," considers a number of questions which relate to good designing. Chapters are devoted to Architectural Design; Complex Compositions; Elementary Edifices; Plan Elements Incorporated; Semi-Complex Design; Units; Rhythm; Scale; Expression, and Harmony, the teachings of the text being emphasized by many plates, some showing plans, and others drawings of exteriors or interiors which illustrate the points which the author raises in the text pages.

The practice of architecture in the present-day world is not an easy matter if the architect is attempting to live up to a high standard. There is constant temptation to compromise between what one knows to be right and what circumstances—and particularly clients—render possible, and the architect or the architectural student has need of training himself to a definite standard if he would faithfully serve architecture and present architecture in a proper light before the world.

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THE CONSTRUCTION OF THE SMALL HOUSE. By H. Vandervoort Walsh, Instructor of Construction in the School of Architecture, Columbia University. Illustrated by the author. 269 pp., 7 x 9 ins. Price $5. Charles Scribner's Sons, New York.

THE sub-title of Mr. Walsh's informing and valuable work is "A Simple and Useful Source of Information on the Methods of Building Small American Houses for Anyone Planning to Build." During the past eight or ten years the abnormal costs of building have caused the analyzing of values as never before. This careful and searching analysis has perhaps been even more thorough in the case of the small house than in any other department of building, for erecting even the tiniest of habitations has been made possible only by eliminating everything not vitally essential and by economy not deemed necessary in the days which now seem to have been so careless and wasteful.

To aid in this process of reducing building expenditures, and also to make common property discoveries in new economies which certain architects have made, many books have been published, so that works relating to what is becoming known as "small house architecture" now run into a goodly number of volumes to which this book is a distinct addition. Its method of presentation is thorough, for it begins with a brief consideration of present-day economic troubles before taking up the questions of general types and costs. With these preliminaries disposed of Mr. Walsh discusses each separate part of the building and covers methods of construction, heating, plumbing, lighting and other electrical work, interior finish, in fact from first to last every detail of the subject from the beginning of excavating to the final detail of work on an interior. The later chapters of the volume deal with "Building the Setting for the House."

PRACTICAL GEOMETRY FOR BUILDERS AND ARCHITECTS. By J. E. Paynter, Lecturer on Building Subjects, Goldsmiths' College, University of London. 409 pp., 5½ x 8½ ins. Price $8. E. P. Dutton & Co., New York.

STUDY of many subjects loses much of what might render it interesting in the classroom because the student sees no means of making practical application of its more or less abstruse teaching; it seems to be a matter largely of theory, but the theory must be learned before there can be any intelligent attempt at application later on. This is particularly true of any subject which involves mathematics, and the student who plods through the various departments into which mathematical studies are divided little realizes the important part these subjects play in many of the technical professions, when application of theory becomes eminently practical.

This work has been prepared by a well-known English authority on subjects connected with building, and is intended for the use of architects, builders, surveyors, and others whose work involves the use of geometry. In no sense a primer or an elementary work intended for beginners, it is planned for the student who has had more or less grounding in the mathematical studies which lead to geometry, for the architect or builder who must find some solution for the problems which come up in practice or in actual building, or for anyone making private study of the subject. The volume possesses an undeniable value for technical students who are studying practical geometry in connection with building, carpentry and similar trades, and to make its use more helpful there are at the end of the text a number of problems in the solving of which the student will gain added dexterity in applying the teachings of the work itself.

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VOLUME XXXIX NUMBER 2

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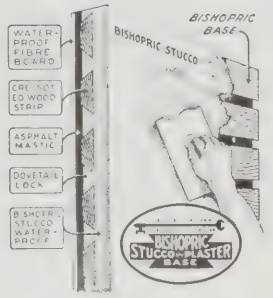

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THE EDITOR'S FORUM

MONTEVIDEO PALACE

THE Pan-American Union announces that the designs submitted in competition for the municipal palace at Montevideo, notice of which was given upon this page in THE FORUM for April, will be received at the office of the Consul General of Uruguay, 17 Battery place, New York, until September 8. All charges for packing and forwarding will be for the accounts of the competitors.

WINS BEAUX ARTS PRIZE

THE "Paris prize" of the Society of Beaux Arts Architects, a scholarship given by the society amounting to $3,000, and entitling the winner to admission to the advanced class at the Ecole des Beaux Arts, was awarded by a jury to Leo Rombotis of the University of Pennsylvania. The scholarship provides the winner with means to live in Paris and to travel 2½ years as a guest of the French government.

HOSPITAL FLOORS

THE American Hospital Association Committee on Floors is this year continuing its study on the subject of floors, and solicits samples for testing, these tests to be made the basis of a further report to the annual meeting of the Association. Particulars may be obtained by writing the chairman, Frank E. Chapman, 1800 East 105th street, Cleveland. The committee consists of Doctor Thomas Howell, New York Hospital, New York; Doctor Charles E. Young, Hospital of the Good Shepherd, Syracuse; Charles F. Owsley, architect, Cleveland and Youngstown, Ohio, and J. W. McBurney, Engineer of Tests, Board of Education, Cleveland.

TO SURVEY SEASONAL CONSTRUCTION

SAVING, not only to the building industry and its workers, but to the public generally, is expected to result from the activities of a committee on seasonal operation in construction industries, the appointment of which by Herbert Hoover, chairman of the president's Conference on Unemployment, has been announced.

The committee was formed in the hope that by examining the facts and proposed remedies it might be able to suggest sound solutions, and obtain general co-operation in effecting them. It is the general impression that seasonal building has been due perhaps more to custom than to weather, and it is expected that the investigation will throw light on this and other important points.

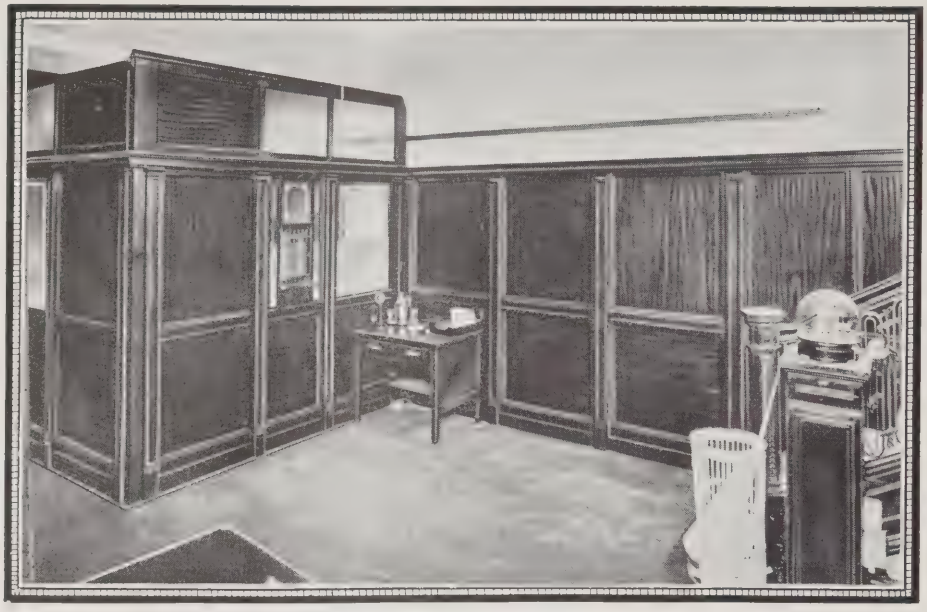
A SMALL HOUSE COMPETITION

THE Community Arts Association, of Santa Barbara, offers $900 in prizes for the best designs for a small house costing not more than $5,000. Those desiring to compete must be registered not later than August 15, and drawings must be received at Santa Barbara by September 1, 1923. Details regarding the competition may be had by addressing Mrs. O. L. Hathaway, Business Secretary of the Community Arts Association, 936 Santa Barbara street, and the jury of awards will consist of five members, three of whom will be members of the American Institute of Architects, with two lay members designated by the Community Arts Association as representatives of the public.

MEMORIAL EDITION OF "SOUND CONSTRUCTION"

SOLON BORGLUM, the late sculptor, spent the last three years of his life establishing his School of American Sculpture. The corner stone of the school's curriculum was Mr. Borglum's method of teaching the principles of construction in the anatomy of man and animal. During his career he had taught at the free school of the Beaux Arts Architects, and later in the A.E.F. school at Bellevue in France, where he had applied this same method. A few months before his death he had completed recording this method of instruction in a book entitled "Sound Construction." In it the pupil is given a knowledge, first of the bones, next the muscles and attachments, and last the skin or surface—thus working from the interior to the exterior, rather than the other way round, as is usually taught.

To forward the publication of "Sound Construction" an eminent group of Borglum's brother sculptors and artists are in committee bearing witness to its high value and splendid purpose. The book will be printed in three colors, in accordance with the author's plan. It will contain over 600 drawings reproduced on a special wove art vellum paper. The size of the volume will be 16¼ inches wide by 10¼ inches high, bound in royal blue, half leather, gold lettered, with marbled end papers and headbands. The memorial edition will include, as a special supplement, a series of beautiful reproductions of Solon Borglum's best known pieces of sculpture. A list of all subscribers to the memorial will be printed and bound in the book. Those interested may write for a three-color circular showing reduced facsimiles of some of the plates of the book, to Raymond V. Ingersoll, Secretary, The Solon Borglum Memorial Fund, City Club, 55 West 44th street, New York.



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The Architectural Forum

The
ARCHITECTURAL
FORUM

VOLUME XXXIX AUGUST 1923 NUMBER 2

European Town Squares

PART I

By GEORGES BENOIT-LEVY

"Have lofty ideas in what you wish for as well as in what you realize, remembering that a plan of noble and rational inspiration, once traced on paper, will never perish. Let our watchword be 'system' and our beacon, 'beauty'."—*Burnham.*

"*STATE in via ac respicite . . .*," said a preacher whom I once heard in a little village church. "Stop on your way, look behind and reflect."

These few notes will have nothing of a sermon, still less of a didactic treatise. They were written in contemplating certain views which are illustrated herewith. In this period when, throughout the world, each people is thinking about rejuvenating itself, in reconstructing upon new bases, I think that the greatest benefit to wish for our centers of habitation, old or new, is, above all, to preserve or to create a personality. Personality is what is actually lacking most in cities as well as in individuals. For the first, it is a result of all the constitutive traits of a city's veritable physiognomy: the general silhouette, interior sites, local tonality, the aspect determined by its different functions, and a thousand other considerations. The modern city has no worse enemies than these *nostradamus* of urban art, these "urbanists" with formulæ prepared in advance. No! The soul of a city is a delicate thing, made of contrasts and intangibles, of impressions and reactions, like the inspiration of a poet or the smile of a Parisienne!

Let us stop, then, on the way, and examine one of the essential attractions of every human agglomeration,—the square. The square has always been the place of culmination of a vast movement, whether of individuals or of merchandise, and this has determined its two principal aspects: that of a center of information, of reunion (the Latin *forum*, the Greek *agora*, the English "Inns of Court"), and that of a center of circulation, the relieving and regularization of the movement of vehicles and pedestrians, such as station squares or those at the intersection of several streets (*carrefours*). There is a third type of square partaking of the character of those preceding, each of which represents a specialty; this is the commercial center (*foire*), the administrative center (*hotel de ville*), and the religious center (*parvis*); each serves a definite function.

According to its location and character, the square may be quite open as a simple crossing of routes, or enclosed like the interior squares of the *Palais de Justice* at Liege, or perhaps "masked," when the streets giving access to it are placed in such a manner as to appear, so to speak, hidden. With these elements a number of variants may be evolved, allowing the architect-artist opportunity for original and harmonious creations.

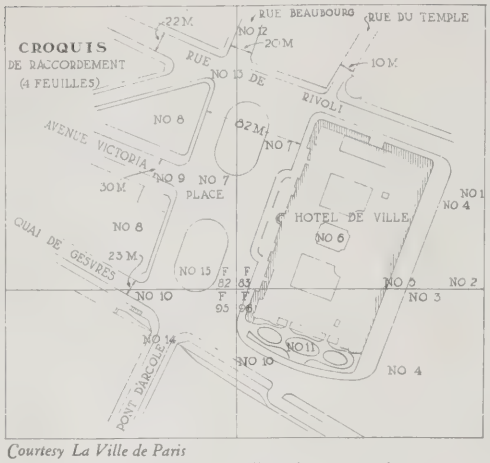
The treatment of the square has been one of the principal preoccupations of city planners and writers on kindred subjects. Among the most notable works I will recall those of Henard, of Georges Cain, of Poete, and of Scrive-Loyer in France; of Stadelbau in Germany, of Unwin in England, of Van de Schwaelmen in Belgium, of de Berlag in Holland, of Olmsted, of Stephen Child, of Robinson, of Burnham, and of Nolen, in America. However, we will content ourselves today with examining a few old squares, where one finds in the greatest degree those elements of individualism which ought to be a source of inspiration for the new cities, and, as we must limit ourselves, we will take our examples from France and Belgium.

Paris

Of Paris, Goethe wrote: "Imagine to yourself this universal city where each step on a square or a bridge recalls a great past, where at every street corner a fragment of history has transpired." The beauty of Paris, in fact, is inherent in its very tradition. Quarter by quarter, street by street, square by square, certain stipulated rights of way have permitted an understanding between the state, the city, and the proprietors to preserve forever the harmony and arrangement of the architectural ensembles.

M. Charles Lortsh has well defined the beauty of Paris by the three terms: grandeur, scale (*mesure*) and elegance, and he has very justly defined the zone of influence in these lines: "The 'right of way' of the æsthetic is, for the most part, established

in the vicinity of the great central artery: *Rue de St. Antoine, Rue de Rivoli,* the *Champs Elysees;* bordering them or on their course, we find the *Place des Vosges* and the squares of the *Hotel de Ville, Victoire, Palais Royal, Pyramides, Vendome, Carroussel, Etoile, Trocadero.*" Now, let us see some of these squares.



Courtesy La Ville de Paris
Plan of Paris City Hall and Surroundings

La Place de l'Hotel de Ville, called before 1830 *Place de Greve,* is bound up with the history of Paris and of France. The oldest *hotel de ville,* or city hall, was the *Maison aux Piliers,* bought in 1357 by Etienne Marcel. The present *hotel de ville* was inaugurated in 1882. It is of the same style as that begun in 1533 under Francis I, finished in 1628 and burned in 1871. It covers an area of 13,000 square meters, forming a parallelogram of 150 by 90 meters. It was only in 1854 that the square of the *Hotel de Ville* was completely freed from the sordid and unhealthy streets which encircled it so closely. In that year the cutting through of the *Avenue Victoria* was decided upon, a street 100 feet wide, which at first was to be extended as far as St. Germain l'Auxerrois and unite the perspectives of the *Hotel de Ville* and of the Louvre. This avenue was inaugurated in 1855 by Queen Victoria, who passed between two rows of decorations representing houses and masking the rubbish of the work of demolition.

The square of the *Hotel de Ville* is an interesting example of a modern square, situated in a network of the most densely crowded streets, and keeping its character of a civic center happily intact. Coming from the east we have the *Mairie* of the *IV Arrondissement* (No. 1) and the church of St. Gervais (No. 2) separated by a square (No. 3) from the annexes of the *Hotel de Ville* (No. 4), themselves joined by another square (No. 5) to the principal buildings (No. 6), facing at the west (No. 7), 82 meters distant, other annexes (No. 8) and the buildings for public audience (No. 8 *bis.*), themselves bordering on the *Avenue Victoria* (No. 9). To the south, the *Quai de Gesvres* (No. 10), 23½ meters wide, and the little garden (No. 11) surrounding the statue of Etienne Marcel, the first mayor of Paris. To the north are structures destined to disappear and to be replaced by municipal buildings, with the ending (No. 12) of the new *Avenue Hotel de Ville,* 20 meters wide, and of the *Rue de Rivoli* (No. 13), 22 meters wide. The great axis running from north to south

Photo. Champagne
The Place du Carroussel, Paris
The old Louvre in the background; traffic passes through arches at extreme left; foreground garden connects with the Tuileries

(No. 15) of the *Place de l'Hotel de Ville*, from the *Rue de Rivoli* to the *Pont d'Arcole*, has a length of 155 meters.

The *Place du Carroussel*, lying in the extension of the axis of the *Avenue Victoria*, and consequently in that of the *Place de l'Hotel de Ville*, beyond the older part of the Louvre, enframed by the new Louvre, and followed immediately by a delightful garden preceding the Tuileries, the *Place de la Concorde* and the *Champs Elysees*, constitutes a well known architectural ensemble. It is a square for promenading or for meditation, surrounded by palaces and museums, where the heavy traffic, which rolls by to the right and left of its central parterre, passes unnoticed. It is a retreat in the heart of Paris.

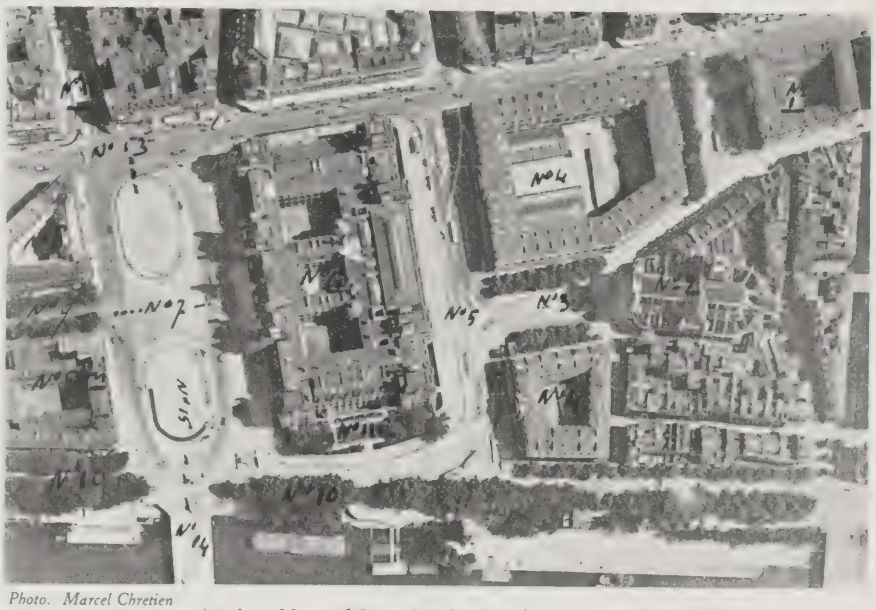


Photo. Marcel Chretien

Airplane View of Paris City Hall and Its Surroundings

See References in Text

The *Place de la Concorde* is the largest square in Paris. At first known as *Place Louis XV*, then *Place de la Revolution*, it was originally adorned with a statue of Louis XV, and later with another representing Liberty. During the revolution the guillotine was erected here for the execution of Louis XVI. More than 3,000 persons were guillotined on this square. In 1836, the obelisk of Luxor was erected here, a monolith of rose syenite, 76 feet high, coming from the ruins of Thebes, covered with hieroglyphics and surrounded by fountains 30 feet high in the style of those of the *piazza* of St. Peter's at Rome. Around the square, eight stone pavilions constructed in the eighteenth century by Gabriel support statues representing the large cities of France; Lyons, Marseilles, Bordeaux, Nantes, Rouen, Brest,

Photo. Ollivier

The Place Vendome, Paris

A square place with closed view except along axis of Rues de la Paix and Castiglione which lead from the Opera House to the Tuileries

Photo. Marcel Chretien

The Place des Vosges, Paris
Under the high-building is a carriage archway

Lille and Strasbourg, by Pradier. The square is bordered by the Seine and the *Pont de la Concorde;* to the south, by the perspective of the *Chambre des Deputes;* to the east, by the Tuileries; to the north, by two *hotels* with Corinthian colonnades, and pediments sculptured by Hodtz and Coustou. These *hotels* are each 96 meters long and 25 meters high. They were erected 1763–1772 from the designs of Gabriel, and served as *Garde Meuble National*, or storeroom of the royal effects, until 1806. The *Place de la Concorde* is today the typical large open square for traffic, important and treated monumentally.

The *Place Vendome*, of octagonal form, with houses built on a uniform plan by Mansart and Boffrand on the site of the *Hotel de Vendome* and the Convent of the Capucines, served as the site of the fair or market of St. Ovide until 1771. The *Place Vendome* shows very well how, even in the center of a large city, in one of the important zones of circulation, the past has been able to impose its æsthetic obligations. Its old houses, conceived as a whole, have kept all their dignity; they now house public offices, such as the Ministry of the Marine, and *hotels de luxe*. The *Rue de la Paix* and the *Rue de Castiglione*, each 22 meters broad, connect it with the Opera and the Tuileries, and take away nothing of the enclosed, intimate character of the square, the axes of which measure 24 meters in both directions.

The *Place des Vosges*, to the northeast and near the *Place de l'Hotel de Ville*, is surely the square which town planners will want to visit. They will

Photo. Manuel

No. 13, Place des Vosges, a Renaissance Hotel, Now Occupied by the New York School of Fine and Applied Arts

see how throughout the centuries an urban site of great beauty has been preserved without change, and they will find there a powerful inspiration which may be applied, in different manners and styles, to modern groupings, large or small. The *Place des Vosges* was created on the site of the old palace of the kings of France, called *des Tournelles*, by an edict of Henry IV, dated July, 1605. All the architectural details were most carefully thought out. Here, in some brief notes, is a *resume* of the characteristics of the *Place des Vosges:*

In the seventeenth century it formed the center of fashion, a vast square with equal sides. To the south, the *Pavillion du Roi* with gateways leading to the *Rue St. Antoine*, and to the north, the *Pavillion de la Reine*. Surrounding it there are 26 pavilions of brick and stone, of uniform plan with vaulted galleries. At the corners there are four fountains; in the center, an equestrian statue of Louis XIII, in marble, by Cortot and Dupaty. No. 21 was the *hotel* of Cardinal de Richelieu. Victor Hugo lived in No. 6 from 1833 to 1848 (*Musee Victor Hugo*). No. 25, *Hotel de Lescalopier*, has belonged to the same family since 1610. At No. 13, which was the home of the actress Rachel, floats the American flag. It is The New York School of Fine and Applied Arts, where, in the salons which have preserved their interior decoration and their paintings of the old days, the flower of the artistic youth of the United States comes to get acquainted with *le gout francais*. So, for every dwelling which surrounds this square we could show historical character, or practical adaptation to modern requirements, at the same time preserving the old-time aspect.

We could go from one square to another in Paris and find in each, except in a few modern and banal examples, a personal character resulting from its function, its history, and its architectural conception. We should find similar squares in most of our cities, and in particular at Strasbourg, Rouen and Nancy, daughters all of a laborious evolution.

Courtesy La Ville de Strasbourg

Plan of Place Kleber, Strasbourg

Courtesy Les Amis de Strasbourg

Place Kleber, Strasbourg
View of side opposite Aubette with Rue des Grandes Arcades at left

Strasbourg

The capital of Alsace is celebrated for its cathedral and also for its gems of urban architecture. Its squares are among its most remarkable features, giving a distinguished setting to its buildings.

The *Place Kleber*, formerly *Place des Recollets* or *des Cordeliers* (Cobblers) on account of a community which established itself here from 1230, had inspired the projects of the architect Blondel, who, in 1765, was to have completely transformed it. These projects were not realized except on one side of the square, the north side, where the building called the *Aubette* was erected, destroyed in 1870 and then reconstructed. It became the *Place d'Armes* in 1681, but has been called *Place Kleber* since the erection of the statue of Kleber in 1840. Many times it has been the center of great events in the history of Strasbourg; military spectacles, voluntary engagements under the revolution, funeral ceremonies in honor of Hoche, of Marat; the planting of a Liberty Tree, important events all.

The streets which open upon it are: to the west, the *Rue du 22 Novembre* and the *Rue du Jeu des Enfants* (Street of the Children's Games); to the south, the *Rue des Francs Bourgeois* and the *Rue des Grandes Arcades*, the latter of which borders the square on its whole east side to rejoin the *Rue de la Mesange* (Titmouse) and the *Rue de la Haute Montee;* to the east, the *Rue de l'Outre* (Street of the Leather Bottle). Quite near is the *Place de l'Homme de Fer* (Square of the Iron Man), a little square which is just as picturesque as its name or the names of the neighboring streets already given. The *Place Kleber* measures 75 meters in one direction and 180 meters in the other. An important center of traffic and a place of reunion, the *Place Kleber* is very well enframed by the *Aubette*, a public building, and by its old-time houses.

Courtesy La Ville de Strasbourg

Plan of Place Gutenberg, Strasbourg

The *Place Gutenberg*, formerly *Place du Marche aux Herbes* (the Vegetable Market), was once the center of municipal life. There rose the *Pfaltz* (Town Hall), the Chancellery, and the Mint—all buildings demolished in the eighteenth century. The *Hotel de la Chambre de Commerce*, which now occupies the west

Courtesy Les Amis de Strasbourg

Place Gutenberg, Strasbourg
The Hotel de Commerce shown in right center

side, is the only souvenir of that old epoch which still exists. It was constructed in 1585 to be an annex of the *Pfaltz;* it became itself the *Hotel de Ville* until 1791. At that date the mayor's headquarters were removed to the *Chateau de Rohan*, a former bishop's palace, which as national property was sold to the city. The *Place Gutenberg* is bordered on the east side by the large street which at the north is called *Rue des Grandes Arcades*, and, on the south, by the *Rue du Vieux Marche aux Poissons*. To the west begin the *Grand Rue* and the *Rue des Serruriers* (Locksmiths). The statue of Gutenberg was erected in 1840. A charming little old square, from its origin it has kept something of the character of a civic center, such as we would like to find in new towns. It measures 70 meters in one direction and 50 in the other. In referring to the plan we will notice on one hand the occupational names of the surrounding streets, and on the other hand, the picturesque widenings of the *Rue de l'Arcade* and the *Rue de Vieux Marche aux Poissons.*

Rouen Cathedral

Rue de la Grosse Horloge, Opposite Cathedral

Rouen

One of the most interesting and picturesque of old French cities, Rouen, the capital of Normandy, a city of art, favored by the charms of nature and embellished by the hand of man, has a cathedral of delicate stone tracery, a cathedral square where the historic events of the city have taken place, and where there still exists among the relics of the public buildings which once surrounded the square the *Bureau des Finances.*

Courtesy La Ville de Rouen

Cathedral Place, Rouen

M. Georges Dubosc, the erudite Rouenais, writes me: "Opposite the cathedral, at the corner of the *Rue du Petit Salut*, one can still see an elegant construction of the renaissance, the old *Bureau des Finances*, where the Industrial Society is installed. It was com-

Rouen Photos. Raitze

Old Houses in Cour d'Albane, Adjoining the Cathedral, with Archway to Rue des Quatre Vents

Second Inside Place of the Palais de Justice, Rouen

menced in 1509 by the architect of the cathedral portal at the expense of Antoine Bohier. This *Bureau des Finances* is an admirable building which bears also the name of *Generaux*, and it is decorated with the royal coat of arms, a letter 'L' in a crown, and a porcupine. It used to contain a prison which was burned the first of February, 1651, together with about 15 prisoners. In spite of the deterioration which took place from 1823 to 1827, the *Bureau des Finances* has still preserved a fine architectural character."

The cathedral square shows how little the present generation has respected the memory of the centuries when this square was in its glory. Instead of conforming to tradition there have been erected modern buildings. Let us turn quickly to that old *Rue de l'Horloge*, filled with historic marvels, which one discovers from the *parvis* of the cathedral, to that picturesque *Cour d'Albana*, and both to the exterior and interior courts of the *Palais de Justice*, a jewel of the renaissance. I predict sure success to the town planner who will group public or semi-public buildings with as much charm as the builders of the *Palais de Justice* of Rouen!

THE charm of old European cities lies largely in the delightfully open character which their squares possess, contrasted with the orderly and close grouping of buildings. The plans given here will aid in visualizing these spaces. Modern town planners and architects will do well to study the elements of their individuality fortunately still preserved.—THE EDITOR.

Photo. Raitze

Cour d'honneur, First Inside Place of the Palais de Justice, Rouen

On European Sketching

By W. POPE BARNEY

WHEN one stops to consider how many studies, sketches and notes an architectural designer produces in the course of an ordinary morning's work in the office, one realizes that half a dozen is in no wise an unusual number; of course these are not very finished, but they convey an idea, and sometimes possess considerable charm. In the light of this, is it not surprising that the same man, when traveling in Europe, will probably have only a few drawings to his credit at the end of each week?

Perhaps this is largely because to make a sketch from nature seems such an effort,—there seems to be no place to sit; the wind blows one's paper; one cannot hold it and sharpen a pencil at the same time, and half a dozen other obstacles arise, silly but irritating, which can only be overcome in advance by giving sufficient study to the working out of a thoroughly efficient outfit,—and then by leaving none of it at home. And in planning this outfit, it would certainly seem wiser, at least until one becomes an inveterate sketcher, to stick to one medium, as this relieves the mind of any possible indecision on that score; and at first there will seem plenty of indecision in another direction,—the choice of that point of view which is exactly right. So few things, fascinating though they be, seem to lend themselves to one's idea of a composition, frozen and set in a groove as one is by the making of formula sketches, with a tree on the right, a cloud on the left and a shadow across the foreground,—a perfectly good formula in the office, where it often seems necessary to get out sketches so rapidly that time is lacking for the study of new compositions, and one repeats the old standby rather than make a failure with the building committee which meets the next day.

The study of textures and old crumbly walls seems beside the mark when one has no formula for their indication, and the idea of really drawing them fills one with an exhausted dismay. And so it goes, until some day, after covering many sheets of paper with fumbling efforts, the sketcher begins to hit his stride and really see things, and feel an enthusiasm to put them down, no matter how much labor it entails. He forgets his old tricks of indication and begins to appreciate the work of the men who really can draw. He cultivates the habit of looking at things as though he were going to draw them from memory, and studies to absorb their significant flavor.

Gradually a whole host of beauties are unfolded to him. Perhaps it is the way the sky shows itself between roofs and chimneys and forms a pattern of itself; or perhaps the way buildings and walls grow out of the ground, and the surface of the earth undulates as it comes towards him, or the grasses and the water in the rutted road make subtle patterns leading into the picture, things which an office cannot teach—but which nature can!

When, with all the multitude of new impressions to confuse the mind, the traveling sketcher adds to his difficulties by jumping from one medium to another, these simple truths about nature come to him more slowly. It is so much easier to master one thing at a time, and he should master his medium so well that he is not thinking of *how*, but of *what* he draws. For most people this takes daily practice. A free, easy, expressive line is the reward of much joyful work, and surely no more perfect opportunity for joyful work in sketching could be offered than is found in leisurely European travel. If one goes rapidly, the sketches become mere notes. It is necessary to feel that there is sufficient time to get the distinctive quality of the place, even if only in a shorthand diagram which can serve as a basis for more considered drawing done indoors when cold or rain prevents direct study from nature.

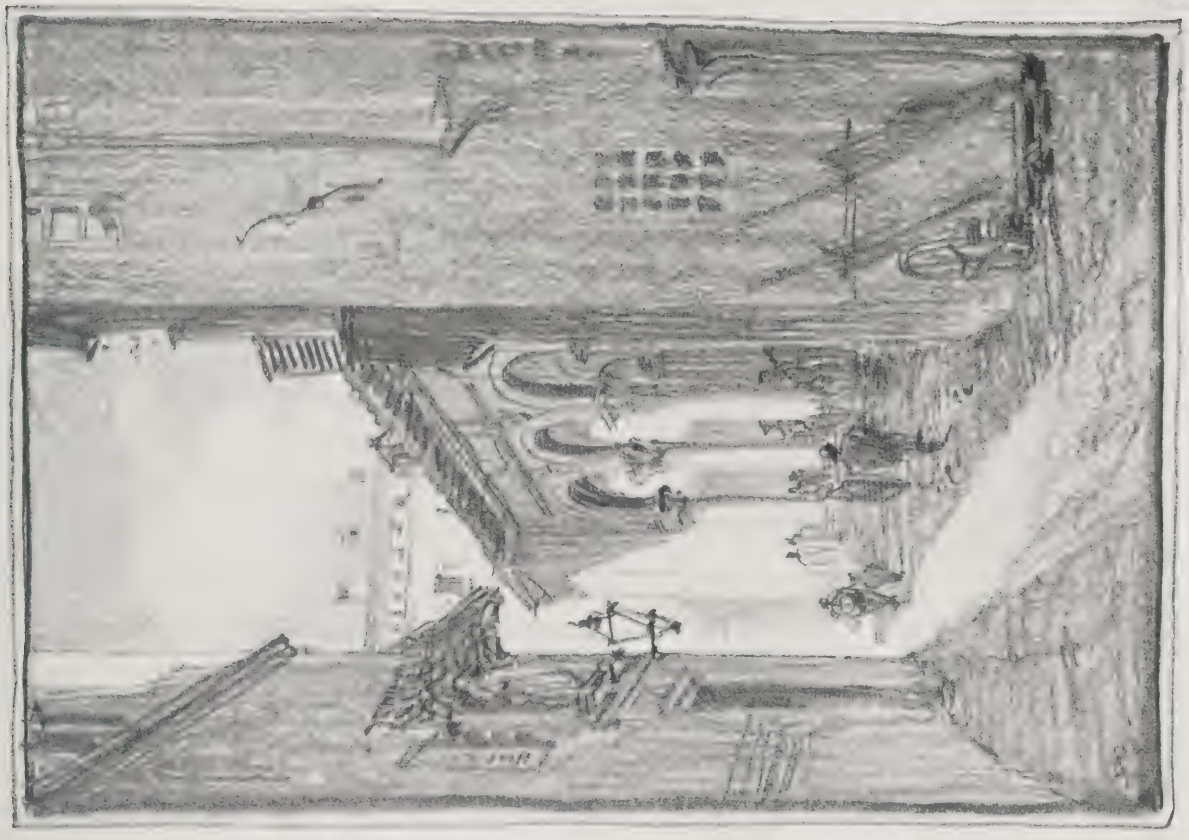
Note of a Florence Street
By W. Pope Barney
Size of original 3⅜ x 4⅝

Such half-memory work made in the evening or during inclement weather attests most truthfully to one's progress in careful observation, of both architecture and values. It is stimulating though humiliating to find how little one observes and retains, and how much

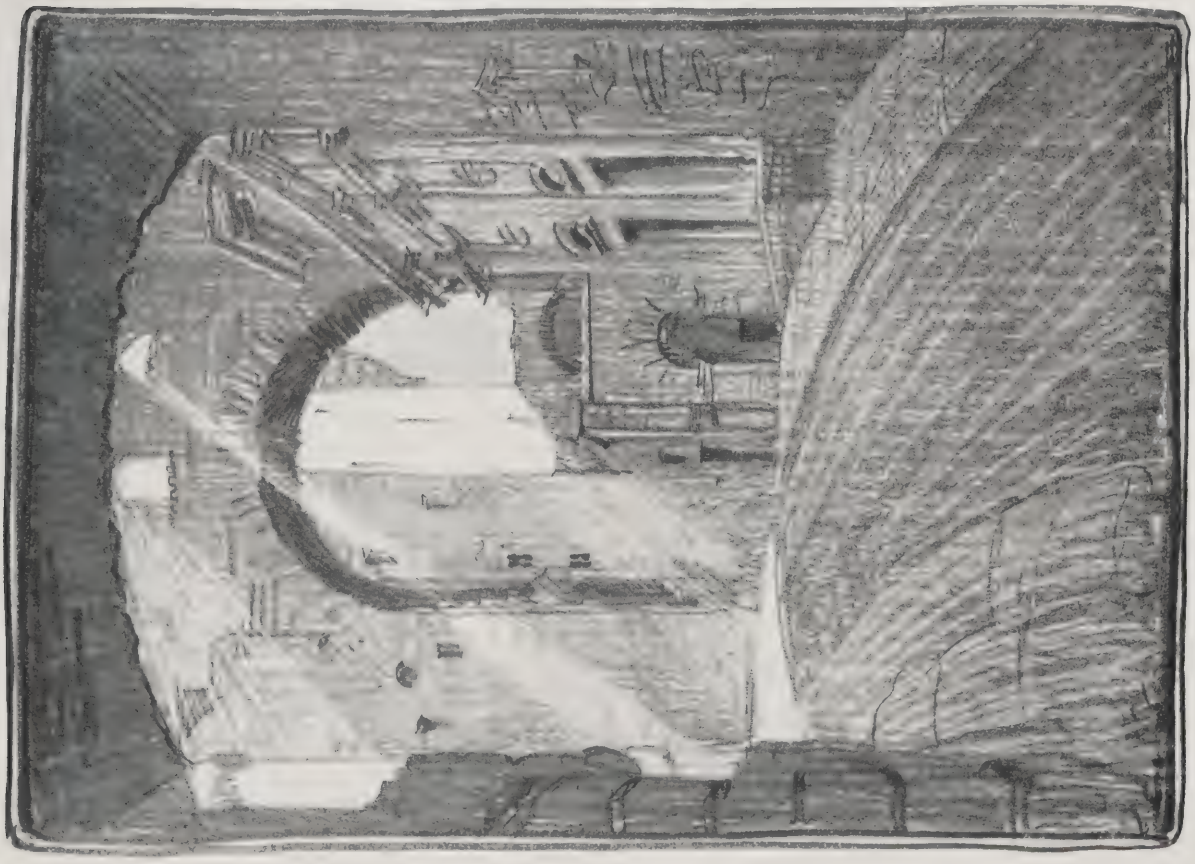
A NORMAN TOWER

MEMORY SKETCH BY W. POPE BARNEY

Size of original 10 x 13



MERCATO NUOVO, FLORENCE
BY W. POPE BARNEY
Size of original 4 3/4 x 7



AN ANCIENT PALAZZO PUBLICO, PERUGIA
BY W. POPE BARNEY
Size of original 5 x 7

at a loss one feels at first in trying to make a selection of significant data. For instance, if one visits a Cotswold manor, and the time is too short to attempt a serious sketch, what are the things to note on paper, and what should be left to memory? To seize the characteristic and essential for notation and observation is the problem.

How often the sketcher will find, when he gets back to his lodgings and takes out his notes for the day, that he has drawn the big elements of the composition, which could have been trusted to memory, but has failed to get the exact slope of the roof, the proportion of mullion to opening, the proximity of eave line to window head, and the maximum and minimum sizes of stones of which the walls are built, and whether the roof rests directly on the wall at the eaves or not! He only remembers that it somehow looked right and was full of Cotswold flavor.

After the sketcher has studied a location thoroughly and absorbed its characteristics, it becomes possible to group and compose the various elements, which he has in a sense made his own, into a series of sketches of some dream village or castle, and so get no end of amusement and profit out of the inevitable wet days. But all this comes at the end and not at the beginning. At first the architect, more than most artists, needs to get away from his formulæ for "snappy" rendering, and observe nature, trying meekly and sincerely to draw what he sees. The result will not be clever, but it will have some quality which chic office studies never have. It may even have some little breath of inspiration, which the place itself conveyed. It may, as time goes on and he gains more command of his medium and more love and care in execution, carry such a message of reality that some friend will say, not "What a lovely sketch,—how did you do it?" but "What a lovely place—where did you find it?" And after all, is not this what an architect wants most to get —the flavor of the places he visits, and the ability to depict the flavor of the places he hopes to create?

Porta Augusta, Perugia
By W. Pope Barney
Size of original 4¾ x 7⅞

From the Duomo Steps, Perugia
By W. Pope Barney
Size of original 4¾ x 8

BUSINESS & FINANCE

C. Stanley Taylor, *Editor*

Organization in the Architect's Office

By HOWELL TAYLOR

FOR some years Howell Taylor, of the office of Richard E. Schmidt, Garden & Martin, Chicago, has been studying the practical background of the architectural profession in its components of business-getting, efficient production, and economical administration. He has had an opportunity of collecting data of direct practical value to all architects. The present article is one of a series which will appear within the next few months, which it is believed will provide an interesting and helpful picture of the logical developments which are taking place in the economic aspect of practice.

One of the most valuable contributions toward the advancement of a profession is a frank interchange of business experience. For this reason it is to be hoped that architects will take an active interest in this series of articles, and will not hesitate to contribute constructive criticism which may be presented in the form of comments at a later date.—THE EDITOR.

IN the development of any organization which systematizes human effort, there comes a period of transition when the personnel is changing from a small, unimportant group, in which the owner thinks for everyone employed, to a living, vibrant institution of many independent thinkers, which is capable of absorbing whatever duty is offered without disrupting the smooth functioning of real co-ordinated business effort. Such a transition is inevitable in an architect's office when it is found that the commissions and number of permanent clients are increasing from year to year and demanding the building up of a force of carefully trained men.

In expanding the business or professional office the primary problem is often in the unwillingness of the principals to give up definite responsibility to subordinates and to concern themselves largely with the broader aspects of professional and business procedure and policies. In only too many business houses it has been found that failure to make this decision is the first retrogressive step, while those concerns which have carefully trained, capable assistants to interpret policies of the firm under broad powers and to work out their own salvation with very little interference, are forging to the front. The turning point between real success and narrow mediocrity hinges on the point of view of the owners and their ability to agree that there are men in the world who are willing to do individual thinking for the benefit of an employer's business.

The same condition is inevitable in building any organization, because human effort has the same elements with which to deal wherever it is found. The professional office which develops without a system will find itself confronted with its weaknesses sooner or later, and they are generally discovered not by members of the firm but by clients who have reason to be disgruntled at the poor service they have received because of a badly organized staff. It is safe to say that the justifiable kick of some rattling good client has caused many an architect to take a shamefaced inventory.

The pitfalls of faulty organization in an architect's office become so self-evident when a logical plan is developed that it is unnecessary to consider them in particular. The most flagrant misuses of a draftsman's time in an office which is growing generally arise from lack of definitely established responsibility and its resulting friction.

In any organized effort which demands the co-operation of many people and the democratization of a single purpose there are but four basic elements, whether the effort functions as an architect's force, a business staff, or some other activity. These are (1) policy or purpose; (2) expert knowledge; (3) results obtainable, and (4) leadership. On their correct co-ordination to fit the case in hand depends the success or failure of the organization. The element of leadership becomes the pivotal point of contact for the first three. In another sense we may say that each executive who represents leadership is influenced in all of his efforts by these first three elements, and it becomes his duty to co-ordinate them. Any analysis of organization which cannot be fitted to this scheme and clearly define responsibility, contains the elements of failure.

To elucidate the meaning of the three elements of organization as applied to the working arrangements of an architect's office, it is evident that (1) purpose or policy becomes the point of view of the principals of the firm; (2) expert knowledge, the consulting service of engineers and others called in or engaged as permanent members of the staff; and (3) results become the physical accomplishments of the organization and depend upon the working staff actually engaged in producing drawings. It is assumed that there is one member of the firm who would hold the executive reins, or a paid member of the staff who would be given executive responsibility for the successful running of the office. However great or small may be the volume of business, the consideration of these three elements will control his decisions.

No one of them can take precedence over the others in importance, because they are indissolubly linked together. Policy or purpose, perhaps, is responsible for a greater degree of good or bad organ-

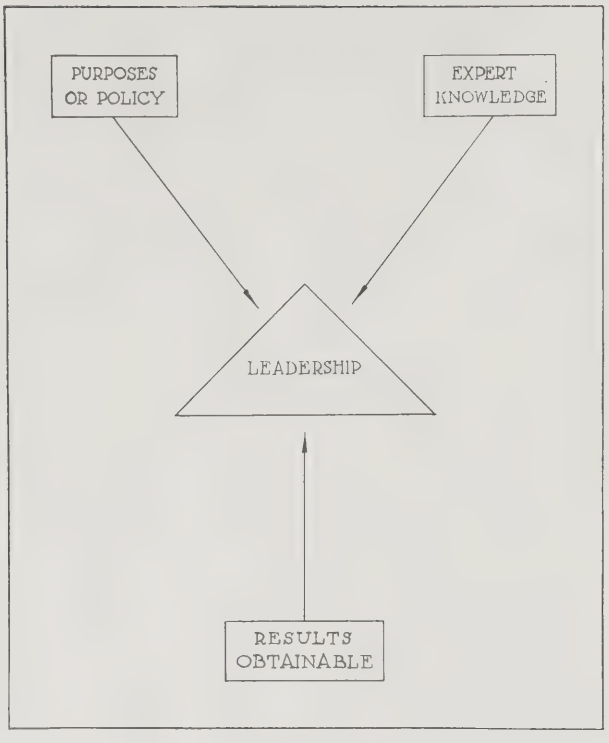


Chart A

ization than either of the others. The point of view of the owners of a business is always reflected in the work of the staff members and in their desire, or lack of it, to give their best efforts to the firm. If results are not forthcoming from the working force, let the principals look to their policies. Causes for discontent are generally more deep seated than casual circumstance would indicate among average good men. "Reason is man's most active human faculty." If he feels that unreasonable demands are being made upon him, or that his employer is governing him through a spirit of criticism instead of through whole-hearted co-operation, he will be discontented. Through thoughtful analysis the employer can establish conditions and morale in his office which will not only keep down overhead expense but will actually enliven and broaden the interests of the office.

The importance of expert knowledge in the balanced scheme is evident. Specialized knowledge is the keynote of accomplishment today, and the successful architect is an executive who is able to utilize intelligently the services of thoroughly trained experts in various fields, with a background of good taste and culture and a discriminating appreciation of design. The nature of the producing staff is of equal importance, because therein lie not only the opportunities for developing the practice but also for preventing lost effort with its resulting money losses.

In order to establish a basis for building an organization it is assumed that the most desirable man for the architect to seek as an employe or to develop in his staff is the fully trained architect who is able to nose out a commission, meet the client, design the building, and take charge of producing working drawings,—in other words, an all-around man who could go into practice for himself quite easily, but who has been convinced by the employing architect that his interests are identical with those of the firm, and who is willing to put his best efforts into the general activity of the firm with the certain knowledge that they will be adequately remunerated and acknowledged. With such men available for development, a firm can become an institution which will build up ideals, ambitions and traditions. Good men leaving the architectural schools will seek connections with such a firm, and they can be selected for their associations and ability.

Into the hands of these fully trained architects is put the immediate responsibility of handling an operation from start to finish. When a new commission comes into the office the client is given to understand that his interests will be cared for by one member of the staff who becomes the "liaison" assistant between the office organization and the client. During the early conferences the effort should be made to have a member of the firm present, but as the client's confidence is established in the assistant less and less of the principal's time need be spent in attending to the details of planning and equipment. Various staff experts are called into conference from time to time, but the liaison assistant is clearly responsible for the operation;—the client understands this, and the staff members as well. It should be the duty of this man to see that the client gets the service from the office to which he is entitled. He has but one superior, the office manager, who keeps general supervision over all work and irons out friction.

As the drawings develop the liaison assistant works constantly with the staff experts, the chief designer and the mechanical, heating, structural and ventilating engineers. When he is ready for additional help for tracing and detailing, he calls upon the chief draftsman whose duty it is to see that men are available as they are needed. Specifications are prepared by the group of engineering experts as soon as the drawings are completed, and to aid them are notes taken during the conferences with the client.

With the completion of working drawings and specifications, the service department lets contracts, attends to all the business details between owner and contractors, and starts construction. All orders and certificates are issued by this department, and in fact no contact is established between the work and the office except through the service department and the liaison assistant who continues to keep in touch with every step in the development of the operation to make certain that nothing sidetracks progress. If proper attention is given to office morale, the position of the liaison assistant will be seen merely as a right means of co-ordination rather than irksome check-up.

It is important that every communication or document sent to the client should have with it a letter

from the liaison assistant explaining its purpose. Nothing will give the client a greater degree of confidence than to realize that his interests are receiving systematic attention in the various departments of a large office, and that he can always get satisfaction from one man who knows all about the details of his particular building. Nothing will breed more discontent and dissatisfaction in his mind than to receive the impression he is being handed about from one to another executive without any connecting link or definition of responsibility.

Chart "B" provides a graphic explanation of this plan of organization.

With the use of an organization plan such as is here outlined it is evident that in cases of necessity final decision rests with the office manager who must interpret the policies of the firm. For average working conditions, however, the whole force will function without his detailed attention.

In this plan there are no department heads of equal responsibility, a fact which eliminates friction and thereby saves many drafting hours. Especial care should be exercised by the principals of the firm in maintaining the executive power of the office manager. He alone should interpret policies to the force. Nothing will disrupt the morale of a working staff more quickly than any indication of lack of confidence by the owners of a business in employes who are hired for executive positions. Where a member of the firm assumes the position of chief designer, he must be willing to co-operate fully with the office manager to determine the desirable compromise between beauty of design and practical utility. If it is worth while to have an office manager, his decision should be final.

But three other items need be considered in a practical working scheme; these are statistics, publicity and business-getting. Every architect's office should have some definite arrangement for obtaining and tabulating useful statistics. This activity may be one duty of a man who is principally occupied on some other task, or it may be made the work of a director and several clerks. The statistical department should be prepared to furnish authentic data on building conditions and costs from week to week. One of the reasons a client should engage an architect is that his ability to determine definite costs is valuable, yet the belief is almost universal that he cannot do this, and in fact the experience of many clients has proved that their architects knew very little about costs.

No architect's office should be without some systematic plan of publicity which is carried out carefully by some one person who makes it his regular activity. Back of every sale, whether the item be overcoats, automobiles or architectural service, the customer's mind must be brought to the buying point. This may be done by means of a newspaper

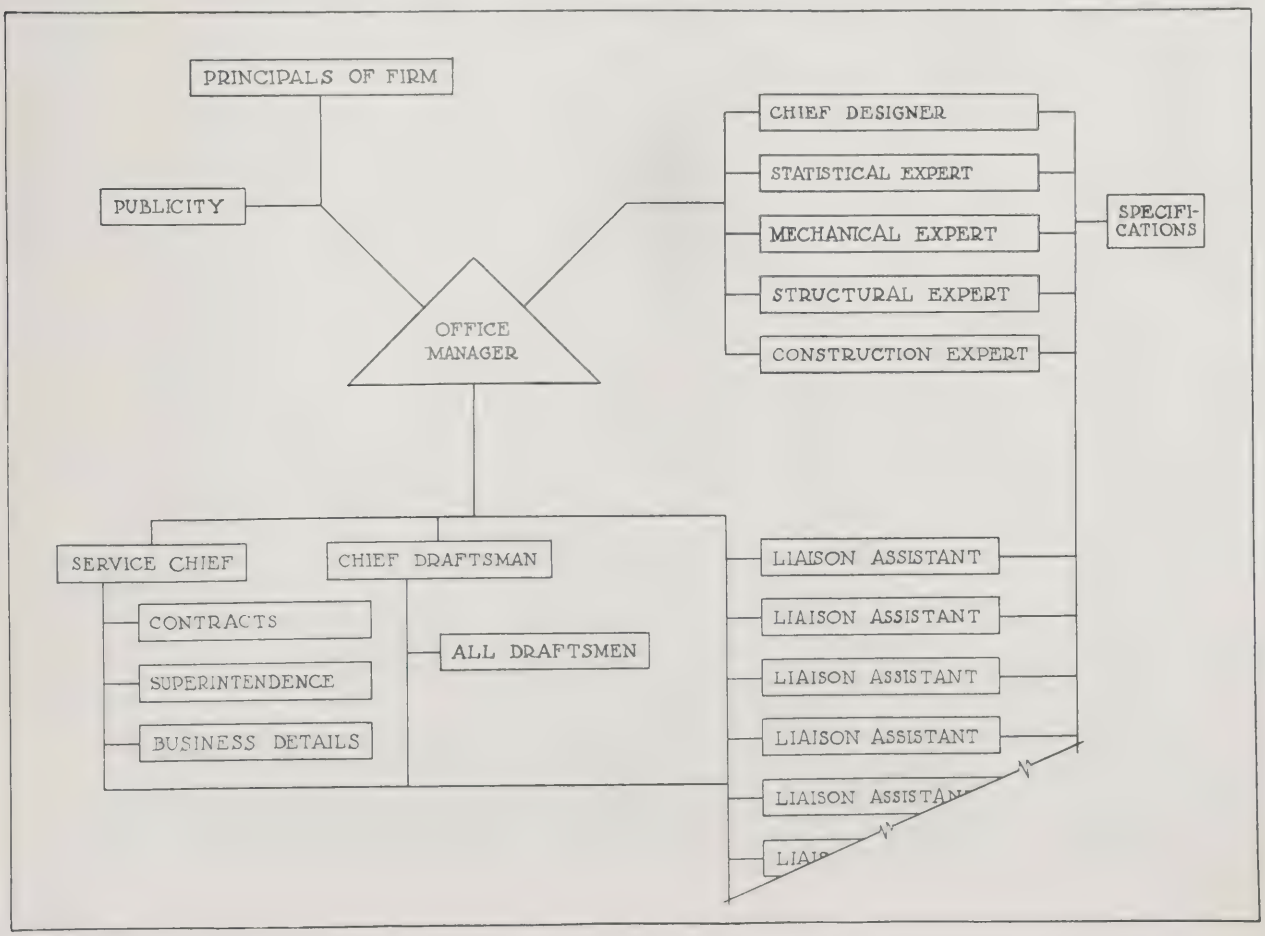


Chart B. Organization Chart for Architect's Office

advertisement, by a well written letter, or by word of mouth, but to consummate the sale it must be done, and the architect who says he doesn't believe in advertising has failed to analyze one of the essential elements of successful practice.

In such an organization as has been outlined, business-getting naturally falls to the principals of the firm not actually occupied with too heavy executive duties, and to the liaison assistants who should be as carefully trained in salesmanship as in other branches of the profession. But in an organization which is on its toes, every man should be made to feel that his efforts to bring in commissions will be appreciated and amply rewarded. Who knows but what a bit of encouragement may not be just the moving force necessary to start some dub-draftsman toward landing large commissions?

Where the spirit of the force is one of consistent co-operation, because each man has had it proved to him that his own right interests lie in forwarding the interests of the firm, a logical plan of organization will save more drafting hours than can a score of office rules.

IT is proposed to lend a more personal touch to the information conveyed through the Business & Finance Section by a consideration of individual problems of office administration which may find general application throughout the profession. Architects are therefore invited to submit to THE ARCHITECTURAL FORUM *specific problems relative to business-getting, publicity, office administration and related subjects. Methods through which these problems have been met successfully in other offices will be considered, and resulting information will be presented in a comprehensive manner but without disclosing names.*

Photo by R. W. Trowbridge

Night View, Entrance to Illinois Life Insurance Company Building, Chicago

Holabird & Roche, Architects

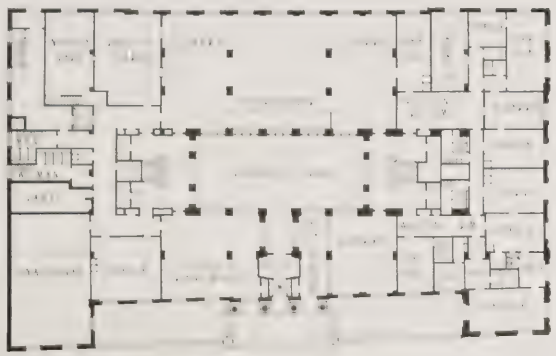
Photos by R. W. Trowbridge

DETAIL OF ENTRANCE

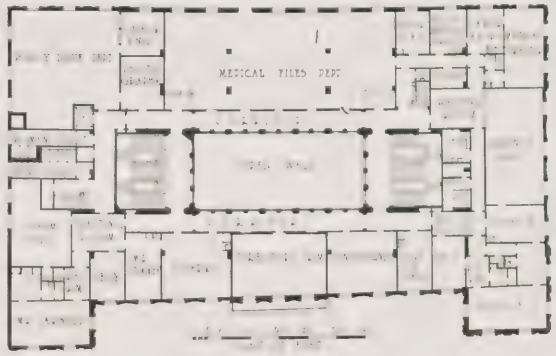
ILLINOIS LIFE INSURANCE COMPANY BUILDING, CHICAGO

HOLABIRD & ROCHE, ARCHITECTS

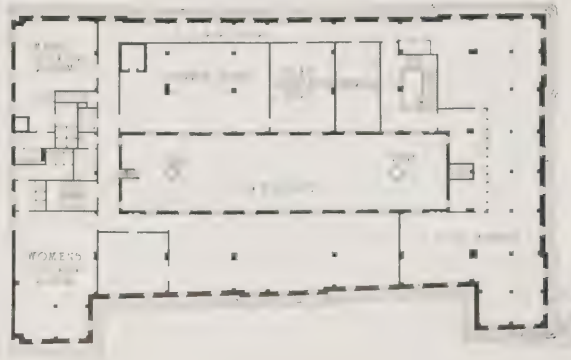
GENERAL VIEW OF LAKE SHORE DRIVE FACADE



FIRST FLOOR PLAN



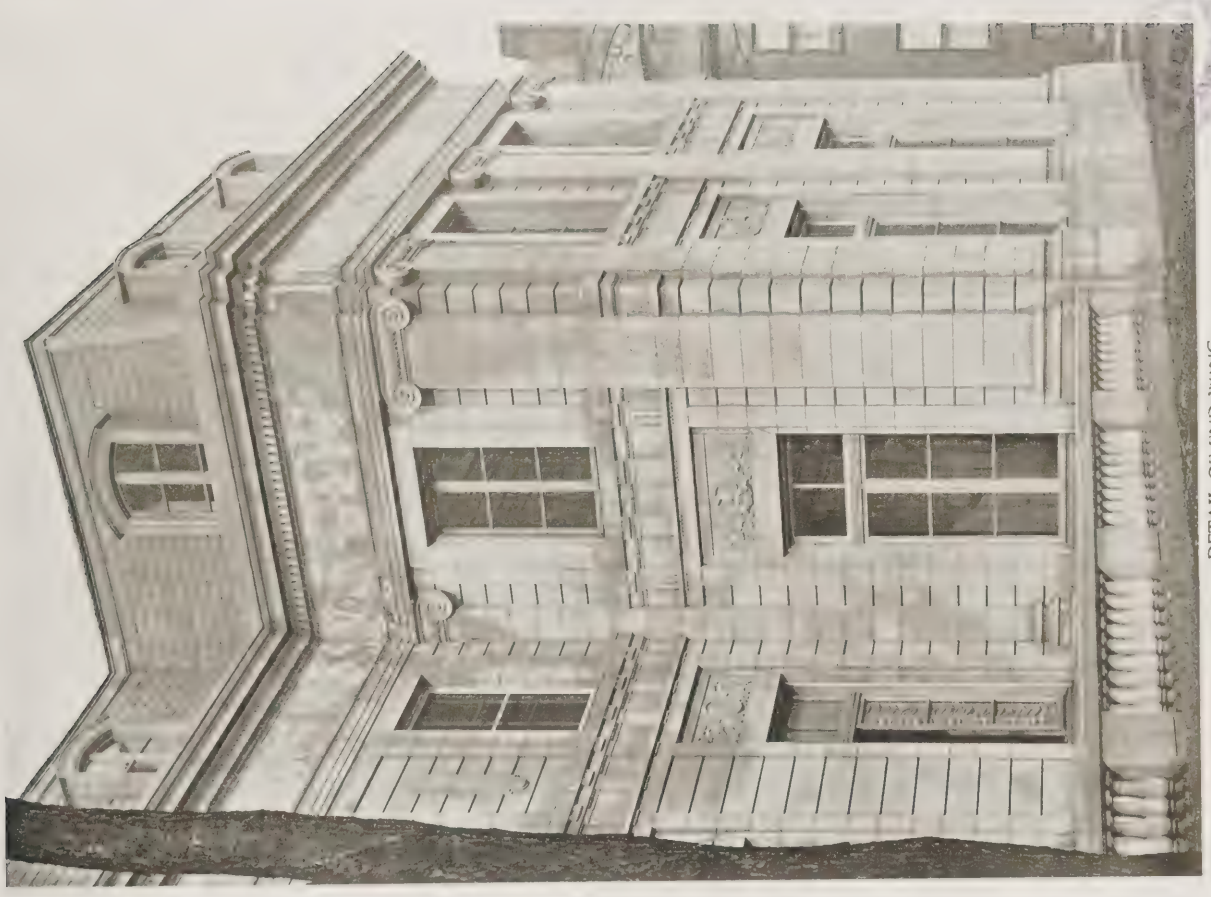
SECOND FLOOR PLAN



THIRD FLOOR PLAN

ILLINOIS LIFE INSURANCE COMPANY BUILDING, CHICAGO

HOLABIRD & ROCHE, ARCHITECTS



DETAIL OF END WING

DETAIL OF ENTRANCE ORDER

ILLINOIS LIFE INSURANCE COMPANY BUILDING, CHICAGO

HOLABIRD & ROCHE, ARCHITECTS

INTERIOR OF PUBLIC SPACE

ILLINOIS LIFE INSURANCE COMPANY BUILDING, CHICAGO

HOLABIRD & ROCHE, ARCHITECTS

DETAIL OF STAIRCASE

SECOND FLOOR CORRIDOR

ILLINOIS LIFE INSURANCE COMPANY BUILDING, CHICAGO

HOLABIRD & ROCHE, ARCHITECTS

EXTERIOR VIEW

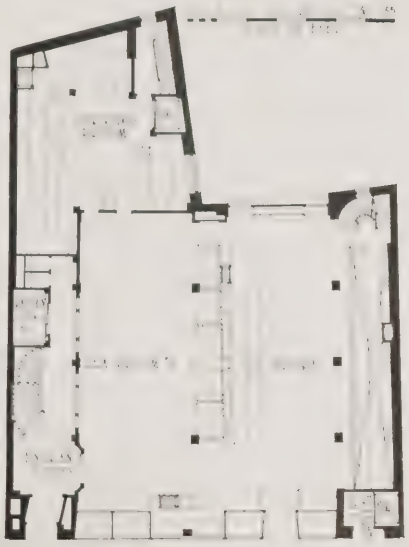
DETAIL OF ELEVATION

BUILDING FOR FRANK G. SHATTUCK CO., WEST STREET, BOSTON

J. D. LELAND & COMPANY, ARCHITECTS

Photos by Paul J. Weber

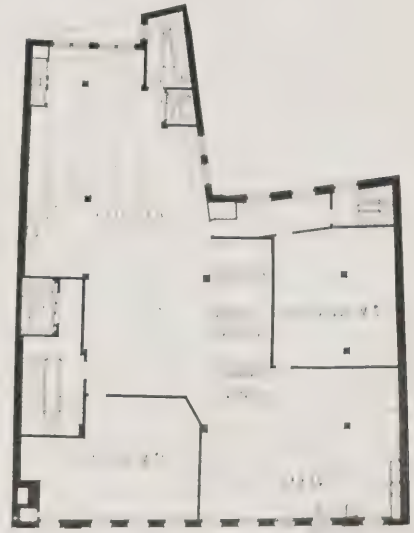
TYPICAL TEA ROOM FLOOR PLAN



FIRST FLOOR PLAN

DETAIL OF LOWER STORIES

FIFTH FLOOR PLAN



FOURTH FLOOR PLAN

BUILDING FOR FRANK G. SHATTUCK CO., WEST STREET, BOSTON

J. D. LELAND & COMPANY, ARCHITECTS

ALCOVE IN SECOND FLOOR TEA ROOM

BUILDING FOR FRANK G. SHATTUCK CO., WEST STREET, BOSTON

J. D. LELAND & COMPANY, ARCHITECTS; CHARLES E. BIRGE, ASSOCIATED

SPACE AT FRONT OF STORE

VIEW TOWARD REAR OF STORE

BUILDING FOR FRANK G. SHATTUCK CO., WEST STREET, BOSTON

J. D. LELAND & COMPANY, ARCHITECTS; CHARLES E. BIRGE, ASSOCIATED

BOOTHS IN THIRD FLOOR TEA ROOM

DETAIL IN STORE, SHOWING REAR PUBLIC STAIRS

BUILDING FOR FRANK G. SHATTUCK CO., WEST STREET, BOSTON

J. D. LELAND & COMPANY, ARCHITECTS; CHARLES E. BIRGE, ASSOCIATED

THIRD FLOOR TEA ROOM, LOOKING TOWARD ENTRANCE

ALCOVE IN THIRD FLOOR TEA ROOM

BUILDING FOR FRANK G. SHATTUCK CO., WEST STREET, BOSTON

J. D. LELAND & COMPANY, ARCHITECTS; CHARLES E. BIRGE, ASSOCIATED

"Vanderhorst Row," Charleston, South Carolina

(A.D. 1800)

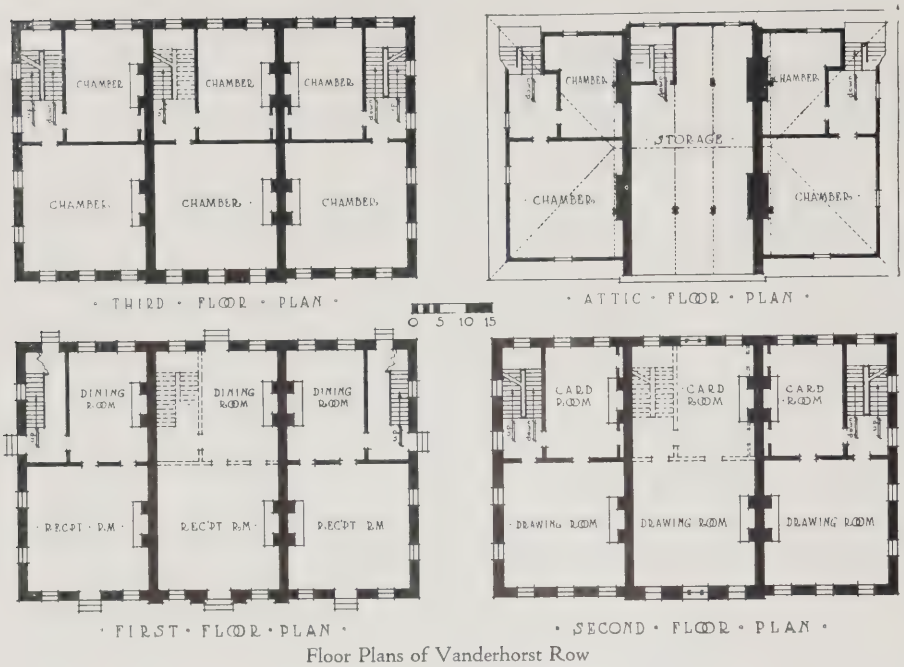
A PROTOTYPE OF THE MODERN APARTMENT HOUSE

By SAMUEL LAPHAM, JR.

ONE naturally thinks of the apartment house as a modern invention, and to refer to a Georgian-colonial apartment house of the time of George Washington and John Adams will naturally evoke cries of mirth, if not charges of desecration from the admirers of that period, who would hate to admit that anything so prosaic and ultra-modern was even thought of in those times. But the germ did exist, even at the height of the period, for when Vanderhorst Row's massive walls were rising from the ground George Washington was still alive, and those standards of colonial architecture, "Homewood" of Maryland, "Woodlawn" of Virginia, and "The Octagon" of Washington, were either being planned or actually taking shape. And equally today with them, Vanderhorst Row survives and flaunts its date of completion, "A.D. 1800," on the marble tablet over its Palladian window for modern eyes to gaze upon.

In every analysis, by construction, by decoration, by social custom, it conforms to the modern apartment house of today as far as the idea could be carried in those times. By construction it conforms, because it is built as one unit under one roof, not as three separate structures pushed together, without accent, to form a tenement. It contains within itself three independent sub-units, all equally and individually complete. True, these units were placed vertically and not horizontally, as is the case today, but that does not violate the principle, for one might say that a modern apartment house is but a series of tenements placed horizontally on top of one another. By decoration it conforms, because it has the decoration of a private home, not the decoration, or rather lack of decoration, of a building to be let to the working class. Tenements are not decorated with stone lintels, keystones and plaques, and Vanderhorst Row is. Palladian windows have not been cheap in any age. In the interior we find fragments of wood cornices with modillions and flutings, and carved chair rails with traces of wainscoting. Only the mantels in the secondary rooms remain; the others have been torn away to be reset in modern houses, even as the early Christians pillaged the Roman temples for the adornment of their churches. Throughout, Vanderhorst Row shows that it was built not for tenement profits, but as a place the units of which would match any moderate

Street Elevation of Vanderhorst Row, Charleston, S. C.



Floor Plans of Vanderhorst Row

home of that day in any city on the Atlantic coast.

Why the idea of horizontal homes instead of vertical homes was not thought of, or if thought of abandoned, is easily determined. Social custom and medical opinion did it. Elevators did not exist, and to be faced with the knowledge that nowhere in the city did the general entrance room or general reception room occur above the first floor (this in order that the sheep might be weeded from the goats before any person entered the family precincts proper) was enough to make an owner desist. Also against the horizontal idea was the then established fact that to sleep on the first floor was dangerous. Yellow fever and malaria had their epidemics and were attributed, not to the mosquito, which ascends only a certain height in its nocturnal flight, but to the night mists from the then undrained marshes, rising each dusk to a definite level. It was thought that the mist harbored the diseases, and consequently must not be slept in. This fact, combined with established custom, rendered a horizontal scheme useless. The designer may have thought of it, but as instantly realized that the lower floor would never be taken and would be a dead loss, to say nothing of the damage to the desirability of the upper two floors by rendering them less readily accessible. In addition to this, the kitchens and servants' quarters were always in a separate building on account of the difference in race, and it was beyond question to design quarters for a whole retinue of slaves, floating in mid-air as it were, to serve the upper apartments. Thus medical theory, social custom and convenience united to eliminate the horizontal apartment house idea and produced in Vanderhorst Row a vertical example. They produced a Georgian-colonial house, but one that hid within itself the germ of the towering apartment houses of today. The idea may be said to have started in the *en bloc* houses of the Adam brothers in London, and to have gradually penetrated to the colonies, but to Vanderhorst or to his unknown architect-builder must be given credit for utilizing and advancing it with the greatest skill and refinement.

History can add but little. We find that Vanderhorst Row was completed in 1800 by Arnoldus Vanderhorst, Governor of South Carolina from 1792 to 1794. A companion house to this was erected a short distance away, but was torn down after the civil war. They indicated the period of prosperity that followed the American revolution, and were a product of the wave of extravagance, due to the large profits of that post-war period, even as we have seen the same wave in hundred-fold proportion produce the ornate 10- and 12-story apartments in the heyday of 1919 and 1920.

Considering Vanderhorst Row from the architectural viewpoint, many items of interest can be found in the reconstruction of the original scheme, for although the century and a quarter that has passed has seen it descend the downward steps of residence, rooming house, warehouse and storage building until it became a deserted shell, save for two rooms used as a cotton office, enough remains in one unit to match parts of the second and to reconstruct between them what is now entirely lost in the third. The outside dimensions of the building are exactly 48 feet by 75, the central portion having a width of 26 feet as compared with the 24 feet, 6 inches of the north and south sections, and projecting 4¾ inches beyond them. The ceiling heights are 12 feet on the first, 12 feet on the second, 9 feet, 3 inches on the third, and 8 feet on the attic floor.

The designer had a simpler problem than the designer of today. He had no plumbing and no bathrooms to cut up his plans; no kitchens and pantries and servants' rooms to be welded and forced into a harmonious connection with the major rooms of his units. All of what today would be called service rooms were by custom, as already said, placed in separate buildings, and thus it was done at Vanderhorst Row. Twenty feet to the rear of the house, according to Mr. H. B. Whilden, whose courtesy enabled the writer to investigate the premises, stood the secondary service building, containing servants' quarters, kitchens, coach-houses, etc. Of these no trace remains today, their very sites being covered by a warehouse built of the brick that was once in their walls.

Thus Vanderhorst Row, proper, was aristocratic in that it had major rooms only, and the architect's

scheme was not complex. The north and south units were identical, except being of opposite hand. At ground floor level are three entrances to each house, giving admission to persons of suitable degrees, the state entrance on the front, the family entrance on the side, and the service entrance at the rear, under the stairs. The first leads directly into the reception room, the others into the stair hall, which is flanked by the dining room. Passing through the reception room and ascending the stairs, one enters into the family drawing room from the stair hall. This is the most lavishly decorated room of any in the house, having a 14-inch denticulated wood cornice with a pentaglyph frieze and a chair rail with the frieze motif repeated thereon. To the rear, over the dining room, is presumably a card room or chamber, with a plain, 5-inch cove cornice and an uncarved frieze. Again ascending the stairs brings us to the third floor, where two chambers take the place of the rooms below, and twisting and ducking under the hip of the roof, as we mount the attic stairs, we find another set of two chambers lighted by dormers. Such are the two end sections of the group.

The central section, having light at the front and back only, is somewhat different. Reconstruction of the first and second floor plans is somewhat hypothetical. Partitions have been swept away, leaving only faint marks. Openings have been cut and filled, windows converted into tin-clad entrances for cotton bales, and the stairs removed. These changes leave little ground to build on, beyond the fact that the stairs ascended in the northeast corner. The drawing room on the second floor has the Palladian window, and traces would indicate that the card room also had one overlooking the harbor. There are also traces of panelwork below the chair rail where the other sections had plaster. What the owner of the central portion lost in side lighting he had made up to him in elegance and comparative splendor, but wreckage has left but the slightest trace behind. The central third floor matched the other two, but the attic was left unfinished and not cut up into rooms. The dividing walls, 21 inches in thickness, run solid to the ridge, the hip rafters of the end sections spanning from the corner of the building to the ridge, while the main rafters of the central section are carried on purlins resting on trusses of 48-foot span, running from front to rear wall and placed 7 feet, 8 inches on centers. These can best be described as being combined king and queen post trusses, with all members, both tension and compression, being of wood. The bottom chord of the king post forms the upper chord of the queen, the lower chord of the queen post being concealed between the ceiling of the third story and the attic floor. No cross bracing occurs in the central panel of the queen post, which is 8 feet high and 24 feet long —but nothing has happened. The timbers composing the trusses are all hewn and vary in size, according to position from 7 x 7 up to 7 x 13. The main joints are mortised, tenoned and pinned, the tension members being strapped to the others by wrought iron straps on each side, fitted over ring headed spikes, through which thin, triangular, wrought iron wedges have been driven.

Solid exterior shutters are used throughout on the first floor. On the other two floors, interior blinds are used, folding back behind the interior trim into recesses in the thickness of the wall, thus giving the effect of paneled jambs. The mullions of the Palladian window are extended on the interior to the full depth of the frame, and the blinds of the central window fold back into them.

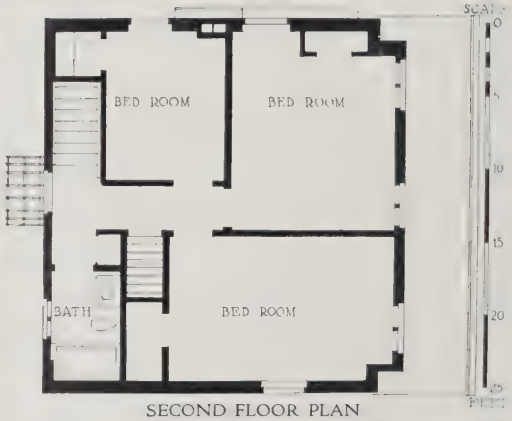
Externally, the photographs indicate the architectural lines and effect better than words could do. Seven West Indian hurricanes and one earthquake have clutched at Vanderhorst Row. The triangular brick pediment of the central portion, probably with a full elliptical oculus, some quoins and keystones, has been the price paid. The repaired brickwork can be easily identified. In addition to the feeling and the scale given by the fenestration, the chief interest is in the plaques and keystones. One rectangular plaque bears the word "VANDERHORST," the other the word "ROW," while the elliptical plaque gives the date, 1800. The keystones, plain, wedge-shaped blocks on the outer portions, become ornamental on the central division. Here they are channeled and ribbed, with raised buttons on the central rib. In fact the similarity to the keystones of "Woodlawn," Virginia (A.D. 1799), is so striking as to make one wonder whether it was due to chance or to copy by both builders of some imported plate of drawings, distributed throughout the colonies.

Such, in brief, is Vanderhorst Row. To praise it would be but to run through the list of qualities requisite to good architecture that any course on the philosophy of architecture names: strength, vitality, restraint, repose, breadth and scale,—all are there. Every factor that makes them—proportion, light and shade, color, solids and voids, balance and symmetry—can be found, and will be realized more and more when the building is seen in varying lights, ranging from tropical noon to winter twilight. It has seen much; it saw all of the notable men of the early republic and ante-bellum days, planters and statesmen, LaFayette, Daniel Webster, Calhoun, Pinckney, the Hamptons, Robert E. Lee; saw nullification and secession and the riots of reconstruction; saw the mustering for 1812 and 1845, the bombardments of 1861 to 1865, the captured Spanish shipping of 1898, and the khaki-laden transports of 1919; saw Jefferson Davis, Theodore Roosevelt and William H. Taft pass by. It is now but a shell, but in spite of that the building lives and has a spirit, as though the vibrations of events long past had given it a soul, and although year by year some little thing yields to the touch of time and of the elements, that spirit remains and impresses those who wander down the ancient street.

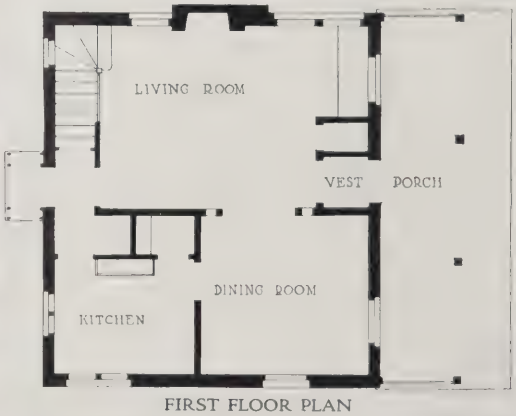
Two Houses at Hackensack, N. J.

WESLEY SHERWOOD BISSELL, ARCHITECT

VIEW SHOWING LIVING ROOM END



SECOND FLOOR PLAN



FIRST FLOOR PLAN

THESE houses, built in 1918-19, cost $5,600 each. They have terra cotta walls with exterior of four-inch brick veneer or stucco. Single-pipe steam heat.

ENGINEERING DEPARTMENT

Charles A. Whittemore, *Associate Editor*

The Insulation of Dwellings

By GEORGE D. BROWN

THE problem of insulation in connection with dwelling construction is one which is age old, but its study in recent years has received a new impetus, due largely perhaps to the increased cost of fuel, and due also in no minor degree to increased knowledge of insulation problems. In the older days when building construction was almost entirely hand work, even to making the sash and frames, and when lumber obtained was of a little different character from that with which we are familiar today, houses were possibly less subject to leakage around windows and doors than the average house at the present time. The fact remains, however, that the people occupying the houses during that period were not so particular as to the temperature maintained in the dwellings as is the custom at present. Possibly to this may be attributed the average measure of health and the growing up of sturdy ancestors.

At the present time the high temperature which most people demand in their residences is, no doubt, in a large degree productive of colds or certain other forms of disease, which, while not serious, are annoying, and which, if we were willing to live in houses with a lower temperature, might in a large degree be eliminated. This is probably a debatable point, and this is not an attempt to make a scientific analysis of sanitary or biographical conditions in connection with insulation.

There is, however, an ideal at which everybody aims in residential work, and that is to maintain a constant degree of warmth in winter as well as maximum coolness in summer. Obviously this is impossible in houses which are poorly constructed or thrown together, and the first thing to be considered in regard to heat loss in winter is ill-fitting doors and windows and poor construction of walls and roofs. No matter how much protection one might give to various parts of the house, if a gale is permitted to blow through the openings around doors and windows, it would be impossible to maintain anything like livable conditions, except at an uneconomical rate of fuel consumption. The first thing, therefore, in connection with insulation is not necessarily to provide some medium to prevent heat loss in walls and roof, so much as it is to prevent unnecessary heat loss at all.

Whatever heat units are generated by the heat producer, whether it be hot air, hot water, steam, vapor, or any other medium, eventually are dissipated through these principal sources: direct radiation through the walls and glass areas, which is unavoidable; loss of heat through radiation from the heater or the conducting pipes; loss of heat through the necessary air changes for ventilation in the various rooms, which is accomplished to a large degree by fireplaces or by ordinary leakage, also by the heat transmission through walls, ceilings and roofs.

In order to have a residence with livable conditions, both as to heat and ventilation, it is necessary to maintain practically a continuous supply of heat throughout the 24-hour period, and this is absolutely determined when the number of air changes or amount of ventilation is established. Changes of air beyond the requirements of ventilation indicate a corresponding waste of heat.

In the majority of dwellings no direct system of ventilation is provided, the leakage around doors, windows and attic spaces usually being considered sufficient. This is, of course, a haphazard method and likely to be exceedingly uneconomical.

The ventilation of dwellings is a subject which can best be well dealt with in a succeeding article. There is no doubt but that demands are continually arising for proper ventilation in homes, and this cannot be accomplished by any such method as depending on ordinary leakage. Strange as it may seem, there are still people, some of them in the architectural and engineering professions, who think all that is necessary to ventilate a space is to take the air out. This is obviously impossible, as the air can be taken out only as an equivalent amount of air is supplied from some other source. Any ventilating fan installed in a box, tightly sealed except for the ventilating opening, would merely churn around a certain amount of air in the blades, a little air being forced into the box and a little air possibly being carried out of the box, but it would at once be obvious that the main air contents of such a box would not be disturbed to any great degree. Consequently in homes, particularly the better types, it would be well to introduce some form of fresh air inlet which will permit of a change of air in a proper manner without depending on leakage.

In many of the older houses, and in many modern houses of better class construction, unless the contractors are carefully watched, the spaces between studs will be found to be open from the bottom to the top, with free air passage into the basement,

and into the various spaces between the joists of the floor construction. This condition, due to difference in temperature, permits the circulation of air so that these spaces soon become nearly as cold as the outside temperature. For this reason, therefore, it would be uneconomical to attempt to insulate against loss of heat through the outside walls if conditions of this sort are permitted. There are a sufficient number of other reasons in good building construction why these spaces should be stopped up, so that every architect or engineer or home owner should be particularly careful to see that there is no direct leakage through the various stories through channels of this sort. Fig. 1 indicates a method of stopping up these spaces, and, while not directly connected with insulation problems, it shows what should be done to furnish the proper closure process.

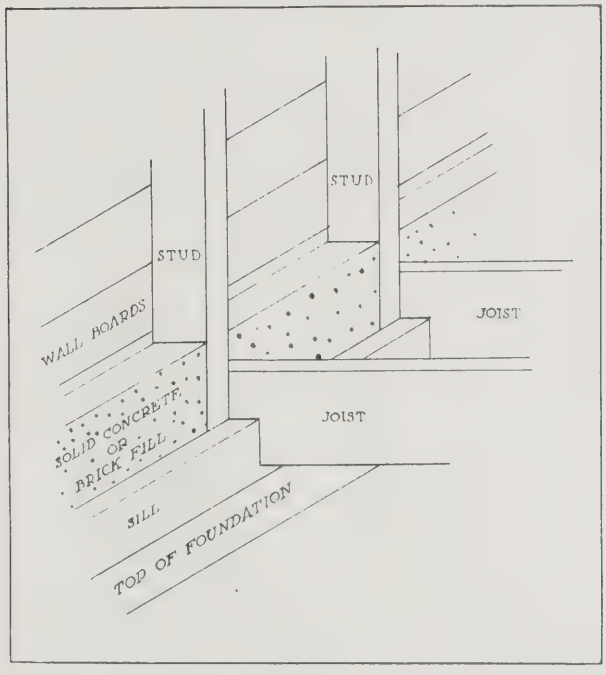


Fig. 1. Solid concrete or brick from top of sill or interior girder will stop air circulation through wall spaces

Not only is it important to prevent cold air from the outside coming into the house, but it is also important to prevent the warm air inside the walls and ceilings from being chilled by almost direct contact with the outside air. This can be accomplished in a variety of ways: First, by doubling up on present forms of construction. Second, by eliminating some of the construction now in use and substituting other materials which have a definite value as insulating mediums. Third, by adding still another insulating medium to the present forms of construction. The second method is particularly applicable in cases of stucco work or brick veneer, as will be seen by reference to Fig. 2. The latter method is efficient up to the point where the additional expense necessitated by the installation of this material effects economy in fuel consumption.

Fig. 3 illustrates one method of insulating the

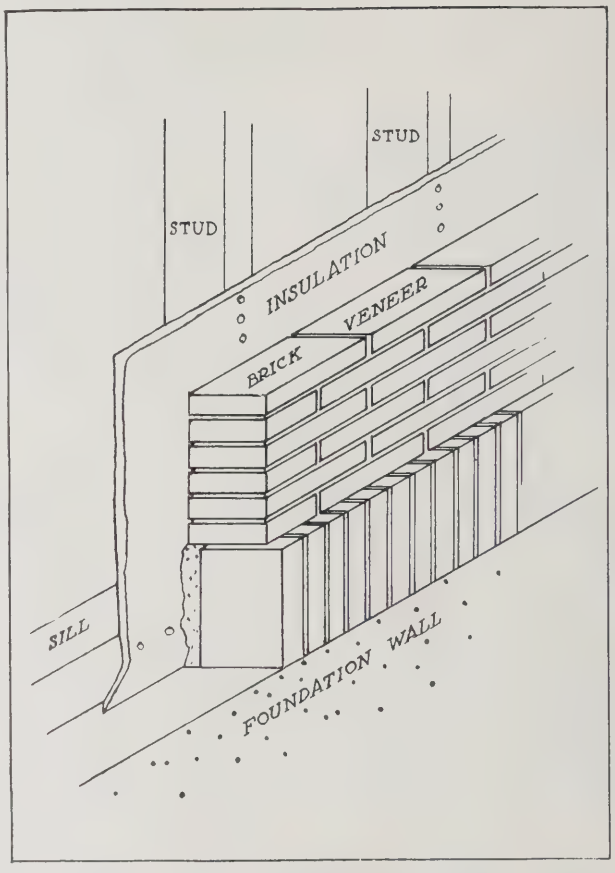


Fig. 2. Insulation applied to outside of studs instead of ordinary boarding

exterior walls which has frequently been adopted with considerable success. This method has also the additional advantage of serving as an additional fire protection in case the material is of a non-inflammable character.

There are at the present time in the market such a variety of materials which have insulating values of various kinds that where a medium of this kind is to be used the architect or engineer should carefully study the relative values of the different types

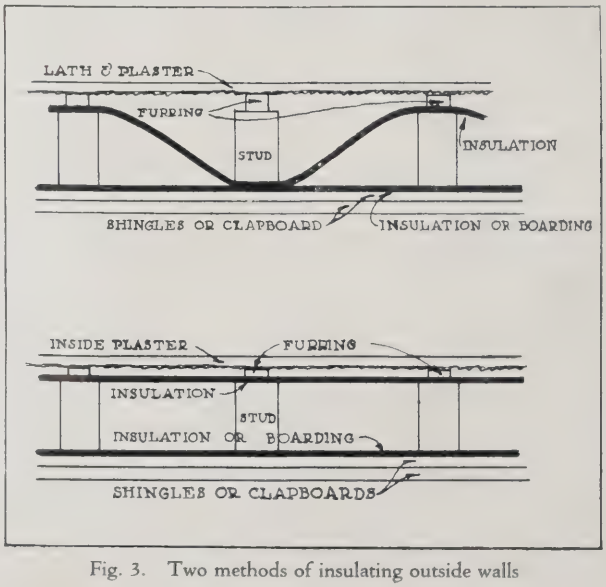


Fig. 3. Two methods of insulating outside walls

for the particular position where they are to be used. For example, certain types of installation will require a flexible insulating material; other installations will require that the material be in a loose form packed in; other conditions will indicate the use of a rigid material, which may serve not only as an insulation, but also as a basis for plaster.

When insulation is mentioned, the material most commonly associated with it is cork board, and in those situations where it is easy to apply it structurally, it is as good as any insulating material available. There are, however, a considerable number of insulating fabrics and a few insulating boards which equal cork in efficiency, and which are much more practical in their application. These insulating materials are made from vegetable fibers such as seaweed, flax straw, wood pulp and the bagasse from sugar cane. Those which are mentioned here as fabrics are such as are made in pliable form; those which are mentioned as boards are such as are made in rigid form having considerable structural strength. Several of these insulating materials have thermal values closely approximating that of cork. In practical use, on account of much fewer joints and absence of air holes, some of them are fully equal to cork as insulation and in addition are much more readily applied.

In most of the tabulations of values of insulating material cork is taken as the standard. It may be because that is the best known medium for the prevention of heat loss. Some of the newer materials coming on the market have, however, a very high value of conductivity which closely approximates, if in some cases does not actually exceed, the values of cork. Tables are as a rule very deceptive. They do show, however, some interesting features in comparison with standard building materials, but without a careful analysis between the laboratory tests and the coefficient value of any insulating medium, and a similar careful analysis under practical conditions, the tables themselves do not give the information which the architect and engineer are actually seeking.

It is perfectly possible, as an engineering function, to figure out the exact theoretical amount of heat losses to the various parts of a building, and by comparing this theoretical heat loss with the theoretical insulating coefficient one can readily make a table showing a very high value in thermal efficiency for the various insulating mediums. In some cases the saving in fuel consumption has been calculated as high as 33 per cent. It is safe to say, however, that the real insulating value of almost any material may be figured on a basis of from 15 to 20 per cent fuel consumption without fear of exaggeration.

In the analysis of the various types of insulating mediums on the market under practical conditions, it would probably be difficult to measure a variation of over 15 per cent in the conductivity of the different types of insulating materials; that is assuming, of course, that the standard insulating material is used as a type and that ordinary sized building paper or tar paper is not considered the same as the flexible or rigid insulating materials.

It is apparent to any architect or engineer who figures the various conditions in the attic spaces of dwelling houses or of other types of buildings, during the winter or the summer months, that there is a point here where heat losses can readily be intercepted. Many times an attic, unused, undivided and unfinished, will be unendurably cold in winter. This blanket of cold air naturally rests on the floor timbers and the ceilings of the floors below, and has a tendency to chill all of the air which comes in contact with the surface. It is obvious at once, in pursuing the theory that warm air rises, that when the warm air comes in contact with this surface a chill falls to the floor so that in a very short space of time the entire room below the attic space would assume the temperature of the attic space itself were it not for the heat units put in through the heating apparatus. It can be seen at once that a condition of this sort causes an extraordinary strain on the heating apparatus, and that unless all of these conditions are taken into careful consideration in planning the heating installation, the radiator or register sizes may be found, after the first heating season, to be altogether inadequate.

On the other hand, in summer the space under the roof becomes unendurably hot, even with windows open so as to produce a circulation of air. Some roofing materials seem to radiate the heat to a far greater extent than others. A slate roof, for example, radiates heat much more readily than wood shingles. Consequently, attic spaces under a slate roof are quite likely to be much warmer in summer than corresponding spaces under a wood shingled roof. The process here is exactly reversed from the process in the winter months. The excessive heat in this upper area tends to communicate itself to the stories below, so that the rooms under these unused attic spaces are correspondingly warmer than the rooms which are under an attic space where insulating materials have been used.

It has been found that by the practical application of an efficient insulating medium, applied directly to the under side of the ceiling rafters, provided the work is carried out with such care as to allow no extraordinary circulation of air from the attic space itself behind this board, the temperature in the attic, during the extremes of summer and winter weather, will be vastly different. As an additional protection, in some instances, both the upper and under sides of the ceiling rafters are covered with an insulating material. On the roof side the boards are applied above this. On the attic side the furring, lath and plaster may be applied if the attic space is to be finished.

There is another phase of this work which is well worth considering on sloping roofs. If the attic space be properly insulated against heat loss, the normal temperature of the upper and under sides of the roofing material itself, for instance the slate,

will be so nearly the same that the only melting effect on the snow as it falls on the roof will be from the rays of the sun. This, of course, would be nearly uniform. While if the attic space be not insulated, the heat loss being greater at the upper part of the roof than the under part near the eaves, on account of the tendency of warm air to rise, the snow will melt and form slides which sometimes are not only objectionable but dangerous.

It is not intended to imply the impossible, that by insulating the under side of the walls this will absolutely prevent snow slides, but it is a fact, which can be demonstrated by observation, that the snow slides are far less numerous on insulated than on uninsulated roofs.

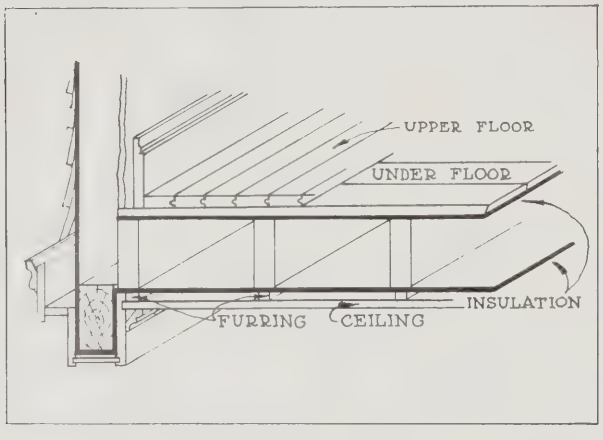


Fig. 4. Insulation of floor over an open piazza

There is one frequent instance in residence construction where some good type of heat installation is imperative. Fig. 4 illustrates such a case and suggests a remedy. This refers particularly to a bathroom constructed over a piazza, but the same insulation is necessary wherever any room, window seat or other occupied space is exposed in this manner to outside temperature. In many modern houses it is found desirable to increase the occupied space on the second floor beyond the area of the ground floor. To accomplish this rooms are pushed out over piazzas or an overhang is constructed. Unless the spaces between the timbers are well filled with a non-conducting material, or unless the floor or under side of the timbers is properly insulated, the resulting cold floor alone causes well founded criticism of the architect or engineer responsible for the work. It is difficult to believe that anyone with the least degree of experience or common sense would expose plumbing pipes or heating conductors in such a situation. The fact is, however, that such things are done through, let us say, inexperience, although oversight might be a better term to use. Such construction should be classed among the criminal offenses.

There are many ways in which the insulation may be accomplished besides that shown in Fig. 4. For example, in Fig. 5 the spaces between the joists are

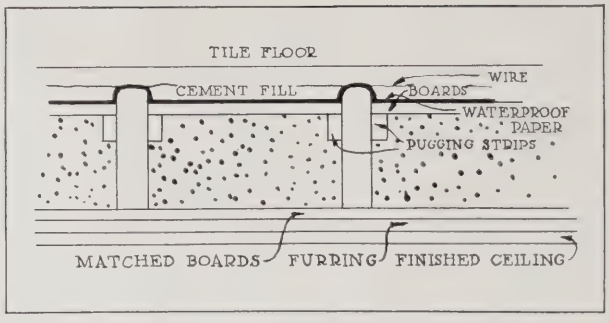


Fig. 5. Loose filler insulation method for exposed floors

completely filled with a loose material. In some cases sawdust, shavings, mineral wool, asbestos, or other forms of loose material may be used. In this construction use of the insulation is not subject to the same criticisms as when the identical material is used to fill vertical spaces between studs.

No matter how fond we are of the "loose" type of insulation, we must admit that during the passing of time the material becomes more dense and closely packed, if it be inert, than when first used. Hence a portion of the space will become uninsulated, while the remainder of the space may be no better insulated than at the beginning. In any insulation medium it is the confined air spaces which afford the resistance to heat loss, and the solid matter merely holds the air spaces in place. If, then, we use a material subject to deterioration from any cause, be it rot, decay, disintegration or compacting, we are solving the problem but temporarily.

Insulation can be used to great advantage in many ways in domestic construction, refrigeration spaces, cold rooms, heating chambers, etc. The first cost should not be a deciding factor. We all remember the days when the covering of a heating system was considered a luxury. We know better now. Soon every home owner will ask his professional adviser on building, "What kind of insulation shall I use?" The architectural and engineering professions can well devote some time to this important matter, and determine the adaptability of the various materials to their respective needs.

The analysis of insulation materials should show:

1. Is the material a poor conductor of heat?
2. Is it inert?
3. Is it fireproof?
4. Is it subject to rot or decay?
5. Is it sanitary, or will it become a breeding place for germs or animals?
6. Is it easy to handle and apply?
7. Has it any characteristics of ductility, or is it brittle?
8. Has it any structural value?

A material which will show the necessary characteristics for the work in hand will be a good investment for the owner.

Wiring for Electrical Appliances

By WILLIAM H. WHITTON

A SUBJECT that still seems to remain largely in the realm of conjecture, even among the central stations that are supplying the electrical service, is the extent to which provision should be made in residential structures, whether apartments or private houses, for the use by the occupants of the various forms of electrical appliances without which, we are about ready to believe, no home is complete. Involved in it are not only the questions of the number and location of outlets—"convenience outlets" is the latest term—to which the appliances may be attached, but that of the capacity of the wiring supplying them, and of the service cables from the street.

That the latter considerations are important may be gathered from the fact, which will perhaps be surprising to many, that it is of quite frequent occurrence in apartment buildings of certain types of occupancy to find that the total load of the household appliances is equal to either the lighting or the power installation of the building, and that in extreme cases it may even exceed the two combined. Fortunately for the wiring in some of the buildings in which this condition prevails, particularly the older ones, the variety of the electrical devices in use, coupled with the natural irregularity in the time of their operation, creates a high diversity factor, spreading the load demands fairly well over the entire day. A certain proportion of the appliances may be expected, however, to be in service during the hours of maximum lighting requirements, and due provision for this condition should be made in planning the wiring capacities of new structures.

Data have been obtained on the subject in a number of typical New York residential buildings, a review of which may be helpful in estimating the probable load requirements of household equipment and in planning an adequate number of convenience outlets, although the rapidly growing popularity of electrical devices of all kinds may set at defiance even the most carefully prepared estimates. A list of the appliances counted in three typical apartment hotels, and included here, will give a better idea of the extent to which this condition prevails than can any general description. The buildings in question are of the usual high class found on New York's upper west side, and can be considered as fairly representative of their type.

Despite the wide variety of utensils listed, it will at once be observed that cooking equipment, both numerically and in the sense of power requirements, is the most important classification. For instance, in Hotel No. 1 we find that in addition to a large number of smaller cooking articles, there are five stoves requiring 7,500 watts, or 1,500 watts per stove, and in Hotel No. 3, 38 stoves requiring 68,716 watts, or 1,808 watts per stove. Second in importance to the cooking implements is the electric iron. As in the case of small stoves and grills of a capacity of 660 watts or less, terminals for flexible cords are provided, and it is then left to the purchasers to connect them to whatever lamp sockets or convenience outlets there may be in the apartments or in the particular rooms in which they are used. An outlet is of course very much better adapted for the purpose than a lamp socket, especially if provision has been made for utility outlets having more than ordinarily heavy wire, but if a proper outlet is not conveniently situated, then the lamp socket is naturally pressed into service. The remedy, of course, is to add more outlets, but although not a difficult thing to have done, for many reasons it is usually simpler to tolerate the evil. In a large sense, the problem is one that demands preventive measures rather than remedies.

To just what extent voltage regulation is affected by the appliance loads in buildings in which their use has increased to such an unexpected extent depends, of course, on the amount of copper provided for the main and branch wiring, the number of outlets per circuit, and the extent of coincidence in the use of the appliances. Even one 600-watt device connected to a lightly wired circuit may occasion a sufficient drop in the voltage to cause a perceptible dimming of any lamps burning on the same circuit. It is quite usual, in planning wiring layouts, to assume an average load intensity of from 50 to 55 watts per socket or outlet. In Hotel No. 1 there are 453 convenience outlets, which at 50 watts each would provide for a load of 22,650 watts. Compared with this is the total appliance capacity of 111,567 watts, or a possible load of al-

Hotel No. 1		Hotel No. 2		Hotel No. 3	
Appliance	Wattage	Appliance	Wattage	Appliance	Wattage
25 Percolators	10,000	14 Percolators	5,946	23 Percolators	13,435
12 Toasters	6,000	4 Toasters	2,175	18 Toasters	9,765
4 Heaters	2,640	1 Heater	550	4 Heaters	2,600
85 Grills	56,100	23 Grills	15,016	36 Grills	20,450
5 Stoves	7,500	20 Stoves	10,786	38 Stoves	68,716
2 16-inch fans	150	69 Fans	3,810	1 Fan	60
32 Irons	18,525	30 Irons	16,026	42 Irons	22,435
4 Vacuum cleaners	946	2 Telautographs	150	1 Vibrator	24
3 Dental drills	360	3 Vacuum cleaners	300	2 Sterilizers	1,200
3 Dental sterilizers	1,800	1 Vibrator	40	1 Egg boiler	600
3 Victrolas	561	1 Massage mch.	35	2 Hair dryers	380
1 Dental converter	120	1 Hair dryer	35	1 Violet Ray mch.	50
1 Curling iron	15	3 Curling irons	86	3 Hair curlers	160
1 Heating pad	15	1 Sewing machine	37	1 Waffle iron	600
3 Sewing machines	323	1 Hotplate	1,306	9 Hotplates	5,224
1 Moving Pict. mch.	47			3 Ovens	2,670
1 Emery wheel (1 1-6 h.p.)	124			1 Heating pad	50
2 Dental wheels (1-8 h.p.)	186				
1 X-Ray machine	5,968				
1 Player piano	187				
190	111,567	174	56,298	186	148,419

most five times as great as the wiring presumably was designed for. Of course it is not to be expected that all of the equipment will be in service at the same time, but on the other hand the load will undoubtedly grow from year to year, and it is to be expected that presently the normal wiring capacity will be absorbed, leaving no margin with which to carry the additional appliances, or the many floor or table lamps which are supplied from baseboard or wall outlets.

In Hotel No. 2, which is more modern by a number of years than No. 1, the outlet provision is much more ample, there being 770 outlets, representing a normal capacity of 38,500 watts. The appliance load at its maximum could be 56,298 watts, which is only about 44 per cent greater than the outlet rating. In Hotel No. 3, which is approximately of the same age as No. 2, a much less favorable showing is made. The normal capacity of the 385 outlets, 19,250 watts, must suffice for a possible load of 148,419 watts, which is almost eight times the outlet rating.

The comparison of the lighting, appliance and power installations of these three buildings may be of interest, more especially the relative values of the two first mentioned, since they are dependent for their current supply on the same set of building risers. The unexpected prominence of the appliance as a serious factor in determining load conditions will be apparent from these figures:

	Hotel No. 1		Hotel No. 2		Hotel No. 3	
	Watts	Percentage of Total	Watts	Percentage of Total	Watts	Percentage of Total
Lighting inst.	64,765	29	70,360	37	120,225	30
Power "	50,541	22	61,265	33	135,026	33
Appliance "	111,567	49	56,099	30	151,403	37
Total	226,873	100	187,724	100	406,654	100

In housekeeping apartments and residences the conditions differ in many respects from those existing in apartment hotels. Observations of the appliance situation were made in a very large number—running into the thousands—of electrically served residential properties representing practically all scales of living. The outstanding features are the almost universal prevalence of use of electrical articles of one kind or another, and the serious inadequacy of the provision made for their proper use, it being necessary, in far more instances than the bare figures indicate, to connect the appliances to lamp sockets—an unsightly, inconvenient, and in some instances hazardous method.

Of the total number of premises surveyed, 69 per cent have at least one electrical device in more or less regular use. There are, however, only 26 per cent of the premises which are equipped with convenience outlets of any sort—baseboard, wall or floor—and it is a fairly safe assumption that the outlets have in many instances been so sparingly provided as largely to fail in meeting the requirements of location and accessibility.

Owing to the much smaller number of cooking utensils, the question of wiring adequacy in non-housekeeping residential property is less of a problem than in the housekeeping type, but the very general use of electric irons calls attention to the desirability of making practically 100 per cent provision for the use of these articles. Irons account for 60 per cent of the entire number of appliances recorded, and owing to their relatively high power requirements, for a very much higher proportion of the electrical load. Next in order, numerically, come vacuum cleaners, followed by toasters, percolators and heaters. The actual figures in a number of typical apartment houses are given here.

HIGH GRADE ELEVATOR APARTMENTS

Apt. House No. 1	Apt. House No. 2	Apt. House No. 3
64 Apts.	108 Apts.	25 Apts.
53 Irons	59 Irons	25 Irons
40 Vacuum cleaners	35 Vacuum cleaners	15 Vacuum cleaners
16 Toasters	28 Toasters	9 Toasters
10 Percolators	6 Percolators	5 Percolators
1 Heater	12 Grills	1 Grill
2 Sewing machines	3 Heaters	1 Heater
1 Heating pad	3 Vibrators	1 Heating pad
1 Drill	5 Fans	1 Thermolite
	4 Curling irons	
	2 Heating pads	
	1 Sewing machine	

NON-ELEVATOR APARTMENTS

Apt. House No. 1	Apt. House No. 2	Apt. House No. 3
5 Apts.	23 Apts.	20 Apts.
3 Irons	16 Irons	19 Irons
3 Vacuum cleaners	4 Vacuum cleaners	7 Vacuum cleaners
1 Toaster	4 Toasters	2 Toasters
1 Percolator	1 Percolator	4 Percolators
4 Fans	1 Fan	5 Grills
6 Medical appliances		1 Heater

In Elevator Apartment No. 1, there are 162 convenience outlets and 1,633 lighting sockets, in 64 apartments, the occupants of which use 124 appliances, requiring power totaling 47,525 watts. The number of portable lamps attached to outlets is not recorded, but making some allowance for this purpose, it seems clear that many of the tenants must be inconvenienced by a scarcity of outlets, for in the majority of instances an outlet, to be properly useful, must not be many feet removed from the spot at which the appliance is to be used. A heater which can only be connected in the dining room will hardly serve to remove the chill in the bathroom, nor will an outlet in the drawing room prove very helpful when the problem is the serious one of energizing the family curling iron.

The figure of about 2½ outlets per apartment prevailing in this building, is fairly representative of the usual small but moderately high priced apartment, but is very much higher than the average throughout all classes, which is but slightly more than ½ outlet per apartment. The result of this almost universal lack is seen in the common use of attachment wires dangling from lighting fixtures, a situation which was very happily hit off in *Punch* some time ago by a cartoonist who pictured a breakfast scene in a prosperous English household. Draped from the ceiling fixture and from a number of wall brackets was shown a bewildering array of flexible cords. Among the complexities of these Jeems, the butler, bearing a tray and a pained expression, was warily making his way, reflecting, meanwhile, on his troubles. "This blessed 'ouse," he meditates, "is so full of modern conveniences that life has become one bloomin' gime of skippin' rope.'

Stains for Interior Finish

By ALBERT B. PATTOU

STAINS, as applied to present-day interior wood trim, are divided into four classes: acid, spirit, pigment and oil. Each presents advantages as compared with the others and in turn possesses disadvantages,—wherein and why will be explained.

Acid Stains

These stains may be purchased in dry form as aniline powders to be dissolved in hot water, so many ounces to the gallon, according to the strength of color desired, or bought in liquid form, that is already so mixed. It saves time to buy them in liquid form, and although some prefer the dry form in order to produce a certain shade, it is inconvenient unless there are facilities for having hot water on the site where they are to be used. The drawback to more extensive use of this clear, brilliant type of stain is that the water raises the grain of the wood, particularly on soft woods,—cypress, gum, fir, etc. The wood must therefore be sanded down again, and on large work this additional labor expense is an almost prohibitive factor.

Even so, where window casements, doors, fixtures or other trim are to be stained red mahogany and are exposed to sunlight, there is no alternative. An oil or spirit stain of the same shade would soon fade out to a sickly pinkish brown or yellow and forever after constitute an eyesore. In many apartments and store windows today may be seen the sad results of trying to provide a red mahogany finish with something other than a water stain. Under present conditions, however, this is not a serious consideration, for the reason that brown mahoganies, walnuts and enamels seem to have the field pretty much to themselves.

Under acid stains might also be included a chemical variety which differs only in that it does not contain aniline dye. Almost the sole modern use for this type lies in securing the fumed oak effect originally produced in furniture by use of the slow and cumbersome ammonia box. The wood is now first treated with a water solution or toner of soluble acids, which does not really color the wood but assures a uniform finish when the fumed oak acid stain itself is applied later. There are also fumed oak penetrating oil stains on the market, which stain in one application, but their tendency is to dull the flake of quarter-sawn oak rather than to bring it out.

Another use for a chemical type of acid stain is arising in connection with the revival of use of bird's-eye maple. It is not now finished a pale natural, but a rather dark brown, and in order that the "eye" may be brought out and an even color assured, a toner is being used, as with fumed oak. It is a question, however, whether this finish will ever become popular on interior trim, as even on furniture it is thus far largely confined to overlay work.

Spirit Stains

The chief advantage of spirit stains, which come both as liquids and as aniline powders soluble in alcohol, is that they dry very quickly and penetrate well. The quick drying, however, also involves a disadvantage for the reason that when the stains are applied with a brush they may show laps, particularly in the lighter shades of mahogany, which are very brilliant. This "lapping" is overcome in furniture factories by using the air brush. So well do spirit stains penetrate that they may even be applied over varnish, and owing to this they are very popular for touch-up work, that is, when it is not desired to clean and refinish all over. This of course requires skillful handling and matching of shades, so that the dry forms are usually purchased.

What keeps spirit stains from more general use, however, is the fact that they are so fugitive to light. This is particularly noticeable in the red and reddish brown mahoganies, which fade more quickly even than the same shades of oil stain. Black spirit stain is of course fast, and is extensively used to imitate ebony.

Pigment Stains

In the days before coal tar derivatives were widely used, painters and wood finishers made their own stains with linseed oil, Japan drier, turpentine, benzine and colors such as sienas and umbers for oak, burnt siena and rose pink for mahogany, burnt umber and Van Dyke brown for walnut, etc., ground in oil. These stains are still used to some extent and pass muster for certain classes of cheaper work. But even when the coloring matter is of the finest they have to be carefully mixed and strained, and when applied they tend to color the surface of the wood rather than to dye the wood fibers and so bring out the figure. This is the real purpose of stain, and by reason of the fact that they do it so much better, the anilines have the field largely to themselves for all medium and fine wood finishing.

Pigment stains are combined with clear varnish to produce what are known as varnish stains, sold in smaller packages, half-pints, pints, quarts, etc., to consumers for finishing woodwork, floors and furniture. They are easy to use, combining the two operations of staining and varnishing, and roughly that of filling, in one. They are not used by painters, of course, any more than pigment stains are used by Grand Rapids furniture manufacturers.

Oil Stains

So far as interior woodwork is concerned, oil stains have perhaps the largest use of any of the stains mentioned here. They brush easily, bring out the wood figure well, are fast as to light except in

red mahogany or green, and do not lap or raise the grain. They dry slowly and often require wiping to insure a clear effect. The word "penetrating" is generally used in connection with them to differentiate them from the stains which *cover* rather than *dye* the wood.

Aniline oil stains are composed of a number of basic oil soluble anilines,—for red mahogany there would be black, yellow, red and scarlet powders mixed with heat in benzole. Other chemicals are then added which help to make the whole brush out better, penetrate more deeply, stay in solution, or give some desirable working quality.

One disadvantage of a number of aniline oil stains, which is also true of aniline acid stains, is a tendency to bleed through succeeding coats of varnish. To meet this, particularly in mahogany, painters and wood finishers apply a thin coat of shellac over them, some even over the filler as well, when the wood is open-grained. This treatment is usually effective and also insures against "tacky" varnish, that is, varnish which does not dry as a result of being applied too soon over slow-drying stain.

Which Stain to Specify

In considering which wood trim stain to use, it is necessary to go back to first principles and recall that stains today serve three purposes: to bring out the beauty of attractively figured woods, to tone down the jar of exaggerated figures, and to secure a harmonious color relation between the wood and the rest of a room's decorative scheme.

The popular woods used for interior trim today in houses of the $15,000 to $35,000 class, leaving enamel work out of consideration, are birch, gum, oak and selected soft woods. Others are used, redwood for instance on the Pacific coast, but owing to natural color they are very often not stained at all.

Birch

Birch, being close-grained, requires no filler and is stained in imitation of mahogany and walnut. When stained to imitate red mahogany the idea is usually to produce a colonial effect. On staircases, for instance, the red stain would be on handrails and treads, with white enamel on the risers and spindles. An acid stain should be used on this work in preference to oil or spirit to insure permanence of color. Semi-gloss or dull rubbed varnish is customary.

To imitate brown mahogany an oil stain is satisfactory, but it should be wiped to insure uniform color and clearness of tone; a wash coat of shellac and either two coats of flat varnish or a coat of varnish rubbed dull should follow. What are known as antique or Adam Brown stains are correct shades. To imitate walnut an extra strong oil stain of that color should be used, as the reddish cast of the birch must be subdued. The same strength of oil stain as is used on walnut itself or gum is not satisfactory for this reason. The varnish finish is the same as for brown mahogany. Walnut is closely imitated in birch.

Gum

Gum, either red gum or sap gum, may be finished to resemble walnut so closely that only experts would be able to tell the difference. It takes an oil stain perfectly, and this need not be strong since the wood has a rich, natural color of its own. Being close grained, it requires no filler, and is most attractively finished with a coat of shellac over the oil stain, then waxed. A more durable finish, without sacrificing the satiny sheen and soft color, may be produced with flat varnish instead of the wax.

For finish of Circassian walnut, which is lighter by several shades than regular walnut, gum should have an acid stain, as an oil stain simply reduced in strength will not give as clear toned an effect. Gum may also be stained red or brown mahogany; for the former, and cherry, a water stain should be used, while for the latter an oil stain is satisfactory.

Oak

Oak is not as popular for interior wood trim as in past years, its use being just now largely confined to floors. There are any number of stain treatments for it: golden, light, antique, weathered, bog and the various periods: Gothic, Flemish, early English, Italian, etc., and ready mixed stains for producing these effects are readily available. Oak is rarely colored with anything but an oil stain, and never in a red color.

Being open-grained, oak requires a filler, and this leads to more or less continuous experimentation in novelty effects brought about by harmony or contrast in the filler and stain. An example of harmony is silver gray oak, produced by a gray acid stain all over and a white or grayish white filler in the pores. The effect is rather pleasing for certain rooms, and variations of it on the Pacific coast are popular, being known as "driftwood."

Another novelty effect is known as Italian or "dusty oak," the wood being stained a reddish brown on the order of fumed, lightly shellacked, and finished with a wax colored gray, which fills the pores to some extent and gives the dusty appearance. "Frosted" oak is on very much the same order, and like the others originated with furniture styles.

Contrast in novelty effects on oak is had by staining the wood brown, gray or green and filling the pores with aluminum or gold. Some of the conventional oak effects are produced without any filler at all beyond shellac and wax: Jacobean, fumed, mission, etc. Very rarely oak is stained a forest green or a smoked color, but in the former case neither an oil nor an acid stain can be guaranteed not to fade; a permanent green has not been found.

Pine and Cypress

Oregon pine (or Douglas fir) has a rather violent figure, and this is hard to tone down even by applying the stain rather strong. It requires no filler,

and is usually finished in antique and dark oak colors. An oil stain is preferable and never an acid stain, as the necessary sanding is endless. Cypress is also rather highly figured, and besides it dents very easily. It is best when stained in brown mahogany, walnut or dark oak effects. No filler is required, and oil stains are customarily used on it.

Georgia pine contains pitch and resinous oils which cause any stain to appear very "spotty,"—dark in one place and light in another. To be absolutely safe, whenever a given color effect is aimed at, from which it is not desired to vary, the architect will do well to consult a reliable stain manufacturer. Supply him with a sample of the trim unfinished, a block showing the actual color desired, and have him match on the trim itself. To specify a ready-made walnut stain of which the architect has only seen a sample on the actual wood is naturally to invite disappointment, and perhaps undeserved criticism of the stain house when that same stain fails to give the exact effect on birch.

In General

In this connection it would be interesting to trace back some of the various styles which have governed woodwork finishing in our era. Very old timers will remember when woodwork meant softwood, painted with lead and oil in white and gray. Others will recall oak and walnut, rubbed with oil and becoming darker with passing years. We associate this style with the gloomy, stuffy interiors of the civil war period, when massive, gingerbread furniture, "warm" red wall paper and superabundant bric-a-brac were fashionable.

At another period everything was elaborately grained, usually in loud golden oaks, the staining and "graining" being done on cheaper woods. Such work was very popular and called for a high degree of skill, but according to modern theories the effect was glaring and coarse. The old time grainers have for the most part died out; the survivors have transferred their efforts to metal furniture and Pullman car trim, and their accurate copying of the natural wood grain is a marvel of perfection.

Wearied of grained effects, popular favor veered to light and golden effects on the genuine oak, and houses trimmed throughout in this manner sold at a premium. Oak did not then cost what it does today, so that it was kept but simply changed in color with the introduction of "mission" furniture. Woodwork was stained to match in various shades of fumed, weathered and bog oak, dull waxed effects taking the place of the shiny gloss varnish inseparable from golden oak.

As closely as can be determined, the vogue of "mission" did not terminate until red mahogany ceased to be an appanage only of the very rich with the discovery that effective imitations were possible on cheaper woods. With the change of color, use of the varnish finish once more returned, polished to a mirror-like surface. There occurred a minor reaction which had its origin in a current craze for sanitation, the idea being for a while to produce in every room as nearly the effect of a hospital ward as high gloss white enamel could make it. Disadvantages were not long in making themselves apparent, especially with regard to doors, where constant washing was necessary to remove the unavoidable marks of handling. To offset this, many left them stained red mahogany, and this effect of contrast with the white enamel framework still holds the popular imagination, and it is in keeping with present architectural usage.

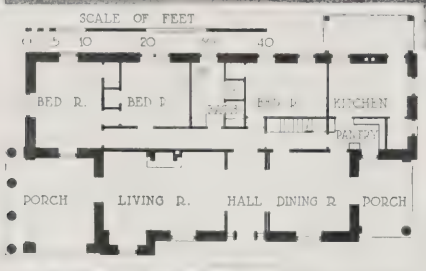
Toward the end of the white enamel stage, ivory enamel furniture came in, and specifications for finishing interior trim quickly followed suit. The enamel was not only tinted to cream or ivory as a relief from the monotonous glare of white, but the surface itself was rubbed down to a satin or eggshell luster. At this period even hospitals had come to realize that apart from the psychological aspect, white was no more sanitary in itself than a tint, and that a dull finish in enamel was fully as resistant to dirt and bacteria as the gloss, besides being much more restful to the eyes.

To bring us up to date, we find furniture finishes running almost 90 per cent to brown mahogany and walnut, with woodwork harmonized to it in almost the same shade of stain. There is in this close matching the recurrent danger of monotony, but it bids fair to be relieved by a noticeable tendency toward furniture decoration by means of hand painted or transferred floral designs and through use of marquetry inlay. What lies in the future it would be difficult to say. We know from the past that there will be a change of some kind, but with public taste constantly bettering we at least need not fear a revulsion to some extreme of freakishness.

Early English Chest in Metropolitan Museum of Art

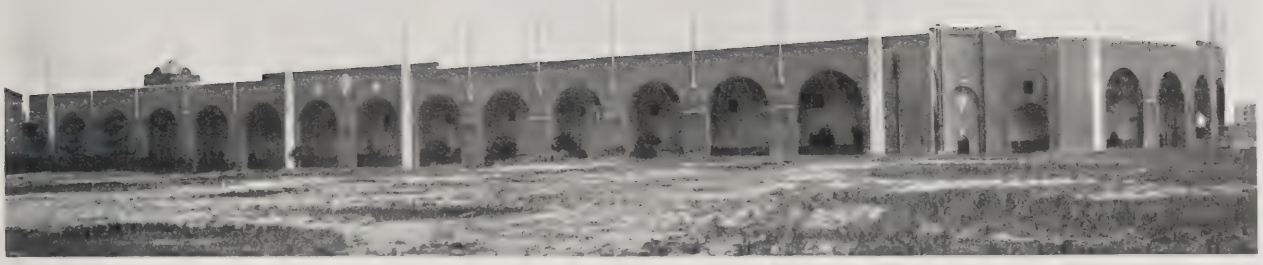
House of Charles J. Cassidy, Esq., Washington, D. C.

MURPHY & OLMSTEAD, ARCHITECTS



THE wall facing of this house is Potomac bluestone laid seam face, providing a great variety of color. The trim is of white marble, tooled finish, and of about the same tone as the pointing. The roof is covered with shingle tile of russet tones harmonizing with the wall. Two rooms and bathroom are on the second floor.

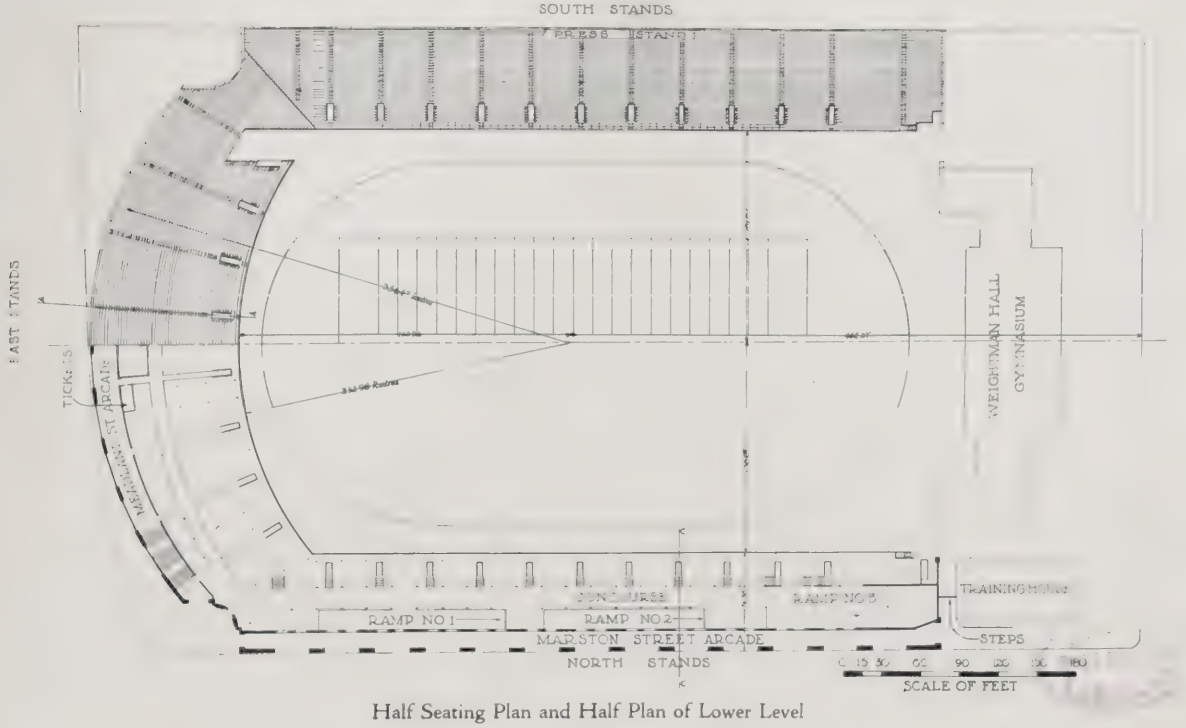
VIEW ALONG TERRACE ON ENTRANCE FRONT



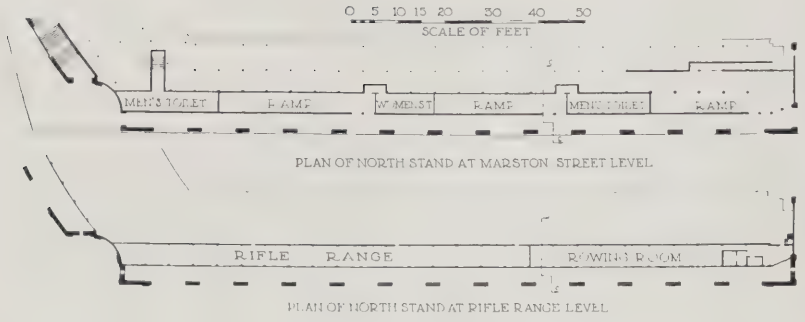
The Franklin Field Stadium, University of Pennsylvania

IN designing and planning a permanent stadium to replace the wooden structure which for many years had accommodated spectators at the university's athletic events, there were several problems to be solved. It was desired to make use of the tract known as "Franklin Field" and long identified with the university's history, and yet the area (about six acres) was small for the building of a structure for seating the desired number of people, and to use the site at all it was found necessary to extend the stadium over the sidewalks around three sides of the property. Another problem lay in planning a structure suitable for football, baseball and a running track in which it was necessary that the entire field be visible from every seat in the stadium. But the difficulties in regard to plan were no greater than other difficulties in the way of design. Franklin Field is adjacent to the University Gymnasium, a structure built in what might be termed the collegiate Gothic style, while also close at hand stands the Archæological Museum, designed in what is described as the early Christian style. Then there was also the difficulty of scale, since required seating capacity necessitated a large expanse of vertical wall.

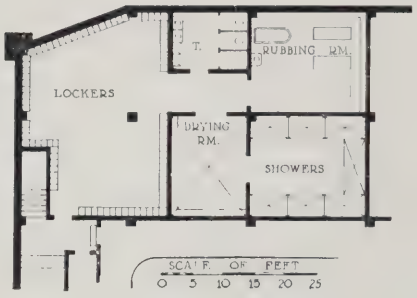
The stadium, as it stands completed, represents a triumph over all these difficulties, for it is of a seating capacity of about 40,000. Greater harmony in color and architecture between the stadium and neighboring structures has been secured than at first seemed possible, for the stadium agrees in color and material with the gymnasium and the museum, and with the museum as to architectural style, both



Half Seating Plan and Half Plan of Lower Level



Plans of North Stand



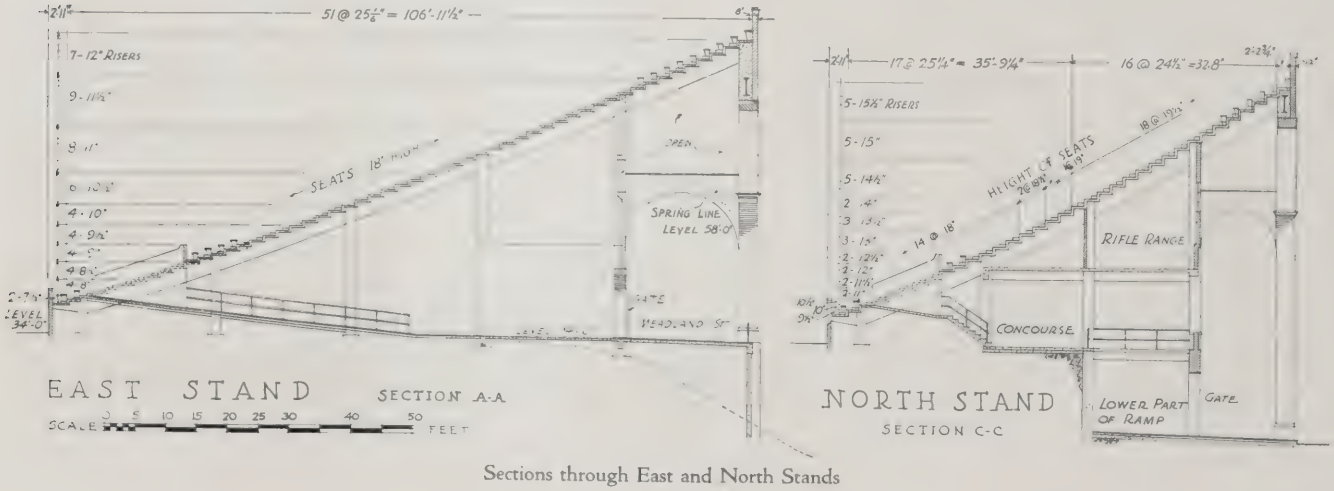
Detail Plan of Training Room

being of Italian origin, while the differences in scale between the stadium and the gymnasium are so marked that there is little opportunity of congruity.

The appearance of the exterior of the stadium was governed by the necessity of extending the structure over the sidewalks. This logically involved the use of an arcade, and the predominating architectural motif therefore consists of a long series of brick arches, the piers which carry them having recessed panels in which it is intended to place memorials or tablets commemorating important events. The character which distinguishes it from other stadia is gained by the high, wide arches made possible by the elimination of alternate columns in the exterior wall. The area beneath the slopes has been arranged with three levels and contains three large team rooms, complete with lockers, showers, rubbing tables, etc., a physician's office, a directors' room, two squash racquet courts with galleries for spectators, five additional smaller courts for squash or handball, a rifle range, a dirt floor area for indoor practice of jumping, pole vaulting, etc., ticket offices, and storage space for equipment and the temporary stands which are sometimes erected for providing additional seating. The structure, within its encircling brick arcade, is built chiefly of reinforced concrete on foundations of concrete piles. Use has been made of concrete columns, girders, beams and slabs, following in general the type of construction now familiar for structures of this kind. The first row of permanent seats is high enough above the playing field to allow a sloping bank of temporary seats to be placed over the running track to augment the seating capacity for football games. The vertical curves of the cross sections are arranged to bring the surfaces of the seating platforms of the adjoining stands together on approximately true miter lines, and these lines give useful and logical locations for expansion joints, which do not, however, extend through the brick facing. An open cut has been left in the east stand for the 220-yard straightaway track and is filled with temporary seats at football games.

No description of a modern structure of this sort would be complete without some mention of the orientation of the field of play. The orientation of the gridiron on Franklin Field, with its long axis running west of north and east of south, was already fixed by its location and the restricting streets, but it happened to be almost perfect. By astronomical calculations the position of the sun for each hour of the afternoon of November 25 was determined. It was found that the sun would reach its ideal position, with its rays paralleling the short axis of the gridiron, at about 2:45 on this date, and that between the hours of 1:20 and 4:30 p.m. it would shine entirely within an angle of 19° with this axis.

An outstanding detail in connection with the construction is the shortness of time required. The stadium was built during the five months between the time of using the old structure for the relay races on April 29, 1922, and the use of the new structure for the football games commencing September 30, 1922. The permanent stands cost, including all facilities, the brick facing and professional fees, $798,342 or $5.919 per square foot or $20.498 per seat.



Sections through East and North Stands

DETAIL OF ENTRANCE AT JUNCTION OF STANDS

Photos by James L. Dillon

EXTERIOR OF EAST STAND

FRANKLIN FIELD STADIUM, UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA

DAY & KLAUDER, ARCHITECTS; GAVIN HADDEN & H. T. CAMPION, ASSOCIATED ENGINEERS

ARCADE OF NORTH STAND FROM TRAINING HOUSE

INTERIOR OF ARCADE BELOW STANDS

FRANKLIN FIELD STADIUM, UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA

DAY & KLAUDER, ARCHITECTS; GAVIN HADDEN & H. T. CAMPION, ASSOCIATED ENGINEERS

FIRST FLOOR PLAN

VIEW OF SIDE TOWARD THE SOUND

SECOND FLOOR PLAN

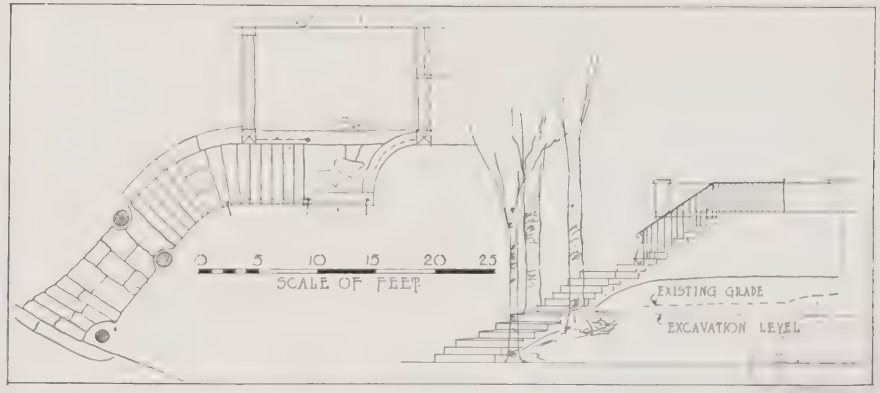
HOUSE OF J. P. CAHILL, ESQ., GREENWICH, CONN.

FRANK P. WHITING, ARCHITECT

Photos by John Wallace Gillies

DETAIL OF STEPS TO ENTRANCE

GENERAL VIEW OF ENTRANCE SIDE



HOUSE OF J. P. CAHILL, ESQ., GREENWICH, CONN.

FRANK P WHITING, ARCHITECT

EXTERIOR OF LIVING ROOM WING

INTERIOR OF LIVING ROOM

HOUSE OF J. P. CAHILL, ESQ., GREENWICH, CONN.

FRANK P WHITING, ARCHITECT

DECORATION & FURNITURE

Light Furnishings for Amusing Places

By AGNES FOSTER WRIGHT, *Interior Decorator*

WHETHER one spends one week or two on board an ocean steamer it is necessary to be comfortable, and an index of the taste of the traveling public in its surroundings is had in the popularity of the palm room aboard ship. The steamship companies appreciate the value of comfort and the part played by attractive surroundings, and they have devoted considerable time and thought to making the palm room and other more or less informal and semi out-of-door places inviting. One has become used to the breakfast room and the sun porch at home, where life is taken leisurely, and hence the popularity of the palm room on shipboard. It's a pity there isn't a better name for it, as one associates palms with the red plush of our old fashioned hotels, or with a "funeral parlor," where the emblem in the window is always a potted palm. On shipboard it might be called the "deck porch," since it is generally semi-opened to the deck and furnished in much the same way as a porch on terra firma; in fact in many respects the decoration and furnishing of a steamship's lounging places are much similar to those of the porch or veranda on land.

As the glare is generally great, much attention should be paid to the flooring which shows up considerably. Linoleums are now made in such marvelous color combinations and such rich, plain colors that the old battleship-gray floor colors should be avoided. Use a green-gray tile marbleized floor with a gray jaspe border, and repeat this green in a *treillage* with large architectural design, which arrests and carries the eye. There are so many moments on shipboard when one's eye wishes to be diverted from the horizon! It is not necessary to train vines up the *treillage*, as the design should be interesting enough in line not to need it, but if one wishes, real or tin ivy, which is an excellent imitation, can be used.

The ceiling can be laid off in diamond shapes with occasional ceiling-light shades of stick-reed, painted green and lined with plaster colored silk. The shades should be large, flat and diamond shaped, about 6 inches deep and covering two spread lights set close to the ceiling.

At the windows in place of curtains, which flap out and in, use roller shades with taut wire attachments top and bottom to keep them from flapping.

Palm Room on the S. S. Leviathan

In daytime these can be pulled up and at night pulled down, as the glare on glass is always unpleasant, and one hates the feeling that every deck promenader is peering in. Shallow 4-inch valances of the stick-reed, painted green and lined, conceal the shade rollers. These valances should be made to conform with the ceiling shades, in straight, vertical lines as a relief from the more fanciful trellis. For roller shades, use a light green sunfast glazed chintz, and have painted on each a brownish gray monkey in various postures. These will be amusing and tie in the color with the gray tile of the floor. The monkeys should be delicately and decoratively done, each perched on a crossbar to unify the decorations on different shades. This color scheme of greens and grays forms a good background for the gay colors of the wraps of the average ocean traveler, much in evidence on shipboard.

Wrought Iron Console and Painted Mirror

The furnishings should be of green stick-reed, small comfortable chairs, with flat gray and green oilcloth cushions, and green tables with gray oilcloth tops. Small, low, green Japanned tables with center handles for cigarettes and glasses should be numerous in order to be always accessible.

A more formal scheme could be used for palm room decoration when the room is mainly enclosed. The flat plastered walls could be painted black and then rubbed with oil or floor wax until there is a slight reflection. The floor could be of a plain black linoleum, well waxed, and for use upon it, if black, there might be mohair rugs which have a beautiful two-toned texture, or use might be made of a black and white tiled floor as a ground for black rugs.

The windows and door casings as well as the simple paneling should be kept black, but the sashes in the windows should be painted blue—a clear, light blue. This same blue should be used on the flat plastered ceiling, with a cut-out stencil, a white swag design, on the walls as a frieze. The design of this should be interesting and should show a good value of black and white. For a center lighting fixture, use a sunburst of black glass balls. If these are unobtainable, get graduated wooden balls, paint them black, and dip in varnish until they shine. These will reflect the blue of the ceiling and add scintillating movement to the room, imparting a certain air of gaiety.

At the windows have heavy black cotton velvet curtains to the sill to draw at night. These will not fade, and are heavy enough not to blow out. As draperies to the floor, use a white wash satin; these should be full but not drawn. For furniture, use orange semi-upholstered chairs and divans and small pieces in two tones of blue, one darker than the ceiling. Palms in orange jardinieres will look well against the brilliant black walls. These are schemes for the gay ocean traveler, whose voyage must be made pleasant and amusing at any cost.

A Wrought Iron Luncheon Set
The wooden table top covered in green and black oilcloth, chair seats and back pads match French felt rug in gray, green and blue

For the porch at home we are generally limited to the wall finish of the house, unless the architect plans three sides to be partially enclosed, in which case in color and finish we are more free to use for the porch walls some color other than that of the house.

Soft coffee color with a henna and black floor is a most satisfactory start for a porch. Cement can be made almost henna color; even a wooden floor can be stained dark orange, and there are many rush mats of natural color, henna and black, which will work in well with this color scheme. Stain all the woodwork a warm, deep,

red orange. Plants look very well against this color, and the green of the window boxes and hanging baskets will be very fresh and tender. If feasible, have a red brick fireplace, with wrought iron fixtures, colored with a little orange paint. In the center of the mantel use a flat, rough pottery vase, and place copper jars at either end, or else a large copper bowl in the center and two large Chinese pottery birds in brilliant blue.

Wrought iron day bed covered in gray striped awning cloth
The stick-reed chair is durable and comfortable

A porch planned with a jut or alcove to hold a long, narrow magazine table is good. Somehow a table on a porch is always being bumped into, and the flower bowls imperiled. This is especially true in a household with romping children and the usual Airedale who dash into the table, whacking things to the floor. So plan an alcove for the main table for magazines and flowers. This should be low and long and painted with a rough stipple finish. All porch furniture should have a rough stipple finish and be antiqued so as not to show scratches or water marks, and also that the texture may conform to the general finish and use of the room. A stick-reed *chaise longue*, orange with *tete de negre* border, with a buttoned seat and back pad of striped blue, orange and *tete de negre* awning cloth, starts the furnishing in comfort, good wear and good looks, which should be the keynote to the room. I prefer stick-reed to the ordinary reed or wicker as it does not squeak or break easily and has more real style. Use with this some of the charming light new Belgium rattan smaller chairs. Thus one gets a good variety, both in texture and color. The rattan is natural color with brilliant blue insert patterns. Sometimes the pattern is red and green, but with the henna and blue awning stripe as seat pads use the rattan with the blue. Two or three small revolving coffee tables, in blue with *tete de negre* borders painted to match the long magazine table, add to comfort and orderliness.

Use glass curtains of linen scrim with a thick worsted fringe of orange, blue and *tete de negre*, the same colors as the awning stripe. Put here and there sunfast, plain, glazed, chintz, vari-shaped cushions in the blue and *tete de negre* and some in a small patterned crisscross orange, or else use the wonderfully serviceable oilcloth pillows of every imaginable shape and color, which are smart, new and durable.

A breakfast porch should extend a cheerful greeting to us in the morning, as so many of us leave our good dispositions above, and come to breakfast with a grouch. The room to greet us should be fresh, clear and crisp. Clear colors should be used, and there are several attractive schemes, such as one might find in the garden, to choose from. A delphinium blue, a lemon yellow and apricot is one, using blue as the main color, the blue walls with the trim of a deeper tone of the blue, and the ceiling a soft lemon yellow found in the heart of the delphinium. The floor could be of the deep blue lavender, and the sash curtains a thin blue sunfast with a cotton fringe of blue

Wallpaper panel framed against marbleized walls

Painted tree design chairs with rush seats that combine well with Italian furniture

and lavender and the curtains hung on lemon yellow wooden rods. A painted yellow breakfast table could have the stretcher, apron and legs lavender, and the folding chairs could be of yellow, with heavy lavender rep seats and backs. These comfortable armchairs were gotten out to use in officers' camps during the war, and are excellent models to use on porches; they lend themselves to many decorative schemes, since the khaki backs and seats can always be replaced by something more decorative. Imagine such a room in the delphinium and phlox season, as each color of the delphinium is picked up in the various parts of the room.

A small luncheon porch for a hotel could have a white terrazzo floor with a black and red border. The lower part of the room could have a narrow red lattice as a wainscot over a white plaster wall; above, against the plain white plaster, could be set old fashioned French costume or Godey prints in narrow red frames set flat against the wall. All the woodwork could be red, and there could be wrought iron square luncheon tables, with their wooden tops covered with red oilcloth with red oilcloth fringe and tassels. In the center of each table a clear glass goldfish bowl in a graceful wrought iron stand could take the place of the conventional bunch of flowers. The chairs would be of wrought iron, left in the natural color or else enameled red, with tiny back pads and seat cushions of the red oilcloth. Red standing lamps, with red and white painted tin shades, would be durable and smart. For curtains, white oilcloth double sash curtains would be charming edged with the bright red laid and stitched on with a perforated border showing through the white. The corners instead of being square should be round. This prevents curling. For a restaurant these curtains are very serviceable, because they can be washed off, as can the screen which hides the pantry door and is made of white stretched oilcloth with panels, marked off by bands of red with perforations.

A gay striped cretonne

A more conservative porch room has painted plain taupe walls with wallpaper figured panels pasted on; and in lieu of the ordinary wooden mouldings

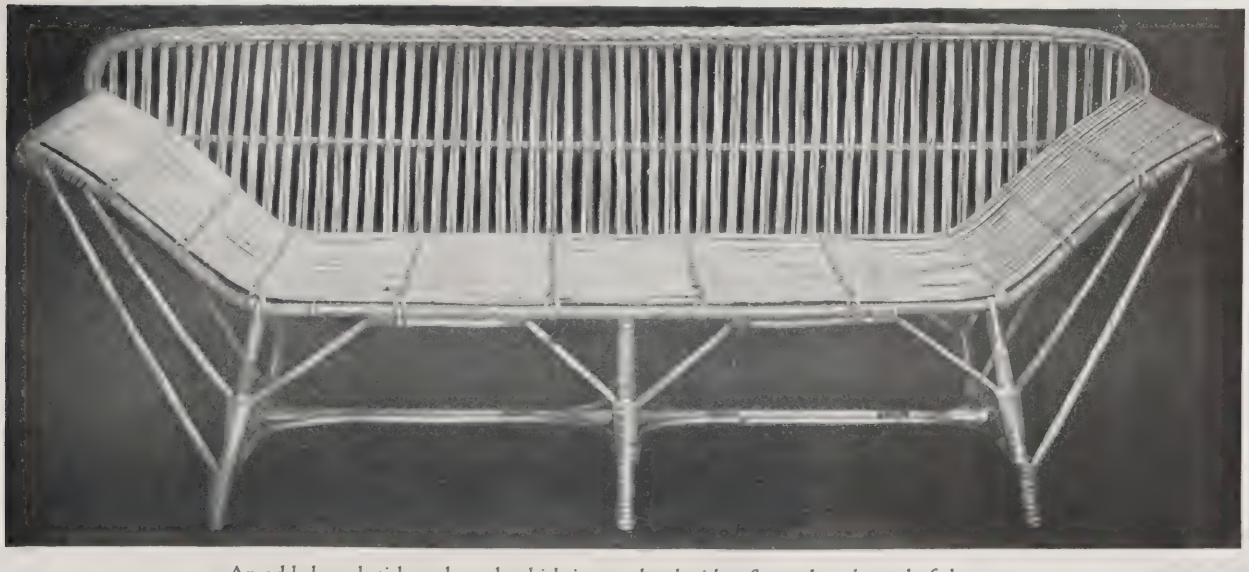
A wrought iron and cane settee makes the nucleus for a sun enclosure. The radiator has a wire mesh cover over which is a wrought iron directoire design

Four modern reproductions of *toile de Jouy* that make distinctive hangings and coverings for occasional furniture

Stick-reed chair

Toile de Jouy is usually printed in one color on cotton of contrasting color with a semi-glazed surface

Iron card table with black glass top



An odd shaped stick-reed couch which is completed with a flat pad to the end of the arms

a moulding line is painted directly onto the panel. Either marbleized paper or a plain paper with the painted mouldings outlining it can be used. At the windows, cherry and cream *toile de Jouy* curtains bound in cherry colored taffeta would be quaint and inviting. Birch furniture stained grayish color, and a double upholstered seat in *toile de Jouy* would make a pleasant spot in which to read the morning paper! A pair of small, low, comfortable chairs in cherry glazed chintz with taupe bindings would tie the walls and furniture together.

A sun enclosure with tile floor made distinctive with wrought iron and cane furniture

Wrought iron and cane furniture has great charm and stands hard wear, as well as being thoroughly comfortable. The chairs have a rather Italian feeling in their design, and, used in an hexagonal room, with rough deep cream plastered walls with decorated pilasters and an Italian fruit garlanded border, they would be enchanting. Use with these a few straight chairs painted with the same fruit swag, reminiscent of Della Robbia, and a table to match, the apron having the same rich colored decorations. A wrought iron daybed goes with this, with its upholstery in warm, rich Italian colors. A serving table with a wrought iron base and a siena marbleized top, with a pair of fine Canti-Galli urns would give a little formality where one would lunch, lounge and really live and enjoy that living.

I think one hardly realizes the great possibilities of the use of mirrors in porch rooms. They are but seldom used, and yet if placed well, nothing is more charming than to reflect a long garden walk with flower borders in a mirror placed opposite the French doors into the garden, or opposite a large window, and if a bowl of flowers is placed on a table in front of the mirror, one can scarcely tell where the garden ends and the flowers begin. A pair of wrought iron consoles with a mirror above framed in wrought iron, placed opposite the windows on the house side of the porch, make the room look much more open, as the mirrors look almost like formal, well balanced windows.

Treillage on walls of a sun room
Charles A. Platt, Architect

Plate Description

Illinois Life Insurance Company Building, Chicago. Plates 17–21.

This beautiful structure, of which Holabird & Roche are the architects, has been recently completed for the sole occupancy of a large insurance company. The building contains only executive offices, and since it occupies a prominent location in a section of the north side which is still almost wholly residential, it was desired that the building be of a character which would be in harmony with its surroundings.

Use has been made of a rich yet simple development of the French renaissance, the broad structure, two stories and mansard roof in height, being built of Indiana limestone, the roofs of black slate, and the roof covering of lead. Among the materials used for the interior are marble, plaster and bronze, while a number of the rooms are paneled in wood in forms which agree with the refined and restrained treatment of the building's exterior.

The plans show the disposition of the various departments and the arrangement of the vaults; the windows are of wood and of French forms; a direct lighting system is used, and heating is by steam. The total cost of the structure was about $500,000, and its erection occupied almost exactly one year, having been begun in December, 1921.

Building for the Frank G. Shattuck Co., West Street, Boston. Plates 22–27.

Designed for the exclusive occupancy of a company operating a number of restaurants and candy shops, this structure presents an instance in which excellence of design is combined with the careful planning which is necessary for the proper conducting of a somewhat complicated business. The exterior which fronts West street has been designed in a modified version of the Italian renaissance, the facade being of limestone, travertine and stucco, while the metal work about show windows, in grilles at certain windows and in railings at balconies, which adds greatly to the interest of the exterior and affords necessary relief to the materials of the walls, is iron, partly cast and partly wrought. The vigorous renaissance cornice across the top of the facade is polychromed. The purposes for which the structure is designed demand ample natural lighting, but the fenestration has been so managed that the symmetry of the facade has been preserved, much of the excellent architectural appearance of the numerous window openings being due to the use of small panes at all the windows above the ground floor.

Such departments of the building as are open to the public are planned throughout to be in keeping with the Italian character of the facade. For walls use has been made of travertine, stucco, hard plaster and painted canvas, woodwork being of walnut or brown oak. Ceilings are of plaster in various forms, while for floors use has been made of terrazzo, tile, marble and composition. For the service departments of various kinds the walls and ceiling are of hard plaster, floors are of tile or composition or else covered with linoleum, and the woodwork is of ash. In a structure of this character much depends upon the successful planning of the details of equipment. For lighting use is made of both gas and electricity; heating and cooking are by steam, and refrigeration is supplied by ammonia piping.

The structure proper, service rooms and all interiors except the tea rooms and store are the work of J. D. Leland & Company, while thetea rooms and store proper were designed by Charles E. Birge. The contract was dated June 5, 1922, and the cubic foot cost of the building was 65 cents.

House of J. P. Cahill, Esq., Greenwich, Conn. Plates 30–32.

Occupying the most unusual of sites, on an island off Greenwich, Conn., this house is in complete harmony with its surroundings. Being built partially upon one of the great boulders which in this part of Connecticut often form part of the earth's formation, the house is chiefly of stone laid with cement joints of an appropriately contrasting color, with certain parts of the building of plaster and wood arranged in half-timber fashion. The stone which is of considerable variety of color was quarried on the island, and much of the timber used was grown on the spot. The very nature of the building site necessitates the planning of the structure upon different levels, and the architect, Frank P. Whiting, has made skillful uses of the exigencies of planning to give to the building an appearance which is striking and unusual.

Since the comparatively small island upon which the house is built is some little distance from the mainland, views from the house are over water in all directions, the exact site having been determined with regard to the most attractive views. A bridge has been constructed connecting the island with the mainland, the bridge being of a character which brings it into agreement with the house and the other buildings upon the island estate.

The stairs which lead to certain of the entrances are literally cut from the rock upon which the house is built; the large roof surfaces are covered with slates of different shapes and thicknesses and varying colors and textures, the slates being laid with unequal exposures. Windows are partly casements and partly double-hung, while the slender railings, use of which adds considerably to the interest of the exterior, are of wrought iron painted black. Interior walls are plastered for the most part, and the woodwork includes paneling and open timbered ceilings in a number of the rooms. Heating is supplied from a vapor system. Cost per cubic foot was about $1.08, and the contract was placed during March, 1921.

EDITORIAL COMMENT

THE BUILDING PROBLEM

THE present difficulties attending the building industry can generally be attributed to one basic factor—the shortage of skilled mechanics. It is perhaps the first time that numerous building operations have been suspended for this reason alone, and it indicates the continued difficulty that will attend efforts to build in proportion to the needs of our population. The reasons for the shortage are many, and no one group is willing to admit the responsibility.

Labor has been able to apply the principle of restricted output which gives it the present opportunity to demand and receive bonuses and unduly high wages; the employers have side-stepped the duty of training workmen and have delegated it to no one else, and the professional interests connected with building have been indifferent. Labor is the only party satisfied with the results of this *laissez faire* policy, but the whip hand it employs today will bring about a lowering of morale that will be destructive in the end to labor as well as to the other elements of the industry.

The problem must be faced and solved, and from the way in which the groups directly interested have failed to accomplish any results beneficial to the public, it would appear that hope now lies with the professional element of building. The construction industry of this country is too large and important to allow its supply of skilled workers to remain any longer a matter of chance. Sufficient numbers of men, adequately trained, must be made available.

Steps toward establishing working plans for the training of apprentices are being formulated in a number of cities, such as New York, Boston, Philadelphia, Portland, Oregon and others, through the medium of the local Building Congress groups which have been organized and promoted largely through the efforts of a few public spirited and far-seeing architects. These few local groups have found that the results of intelligent, non-partisan investigation of local conditions when placed before labor and contracting organizations and state educational authorities have elicited favorable attention and the direct promise of co-operation. The Building Congress idea has been sufficiently tested, and its results have been positive enough to prove that it is on the right track to smoothing out some of the building difficulties; it deserves the support and co-operation of every architect, and if in every city there were an influence at work such as exists in those few cities where the Congress idea has taken root, the aggregate effect would be a tremendous power for improvement and helpful stabilization.

WILLIAM HOLABIRD

IN the death of William Holabird on July 19, the profession of architecture loses one of its strongest and most valued members. During the past 50 years architecture has made unparalleled progress when measured by material achievement, and by an ever increasingly strong position in the world of business affairs, and with progress of both kinds William Holabird was prominently identified. Buildings many and great bear witness to his skill as a master architect.

Born in the state of New York, September 11, 1854, Mr. Holabird was educated in the schools of St. Paul, and entered West Point in 1873 to remain for two years. Coming to Chicago, he entered the office of W. L. B. Jenney where he remained for a number of years before organizing the firm of Holabird & Roche. The eminence of the firm is proclaimed by the long list of great public and mercantile structures designed under the direction of Mr. Holabird. Among the many are the University Club, the Cook County Building and City Hall, the McCormick Building and numerous other office structures, the Hotel La Salle, the Sherman House, and residences not a few. In work of a wholly different character Grant Park and the University of Illinois Stadium bear witness to his skill. One of his firm's more recent works is the Illinois Life Insurance Company Building, illustrated elsewhere in this issue of THE ARCHITECTURAL FORUM.

Among the many causes which lead to the holding of Mr. Holabird's memory in grateful recollection is his prominent part in the development of the skeleton type of building, which has revolutionized construction not only in America but throughout the world. It seems, as one recalls the circumstances, not a great many years ago that the construction of the Tacoma Building at the corner of La Salle and Madison streets in Chicago focussed public interest and attention upon what was regarded by many as a somewhat visionary undertaking, and the success of the structure firmly established Mr. Holabird's eminence and led to the immediate adoption of such construction everywhere. With the Tacoma Building as a beginning, through many years other towering structures took form under Mr. Holabird's skillful direction, the long list being ended with the Chicago Temple Building at the corner of Clark and Washington streets.

Architecture, like Patriotism, records in letters of gold the names of those who not only faithfully serve but courageously lead in the advance of her sons, and among the most honored of these names must ever be that of William Holabird.

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Unusual interiors designed by Julius Gregory, Architect, New York City
Selected from Keefe's "American House"
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A distinctive antique finish for rough-textured walls

PHOTOGRAPHS cannot do justice to the beauty and originality of these interiors in the New York studio home of Charles E. Chambers, artist and illustrator.

Forming a soft, antique background of lights and shadows, the walls keenly arouse an architect's curiosity. Yet the treatment, while unusual, is both economical and simple.

Walls of white plaster, floated rough, first received a ground coat of shellac. Next a coat of white-lead and linseed oil, tinted a warm gray, was carefully brushed on. While this coat was still wet, it was wiped with a cloth. This removed the paint from the high spots of the uneven surface and left it in the crevices, producing a charming two-tone effect of white and gray. The walls were then thoroughly waxed and polished by hand.

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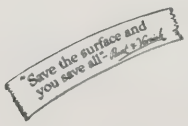

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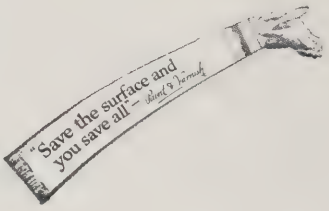

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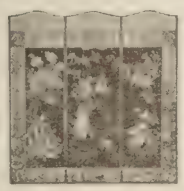

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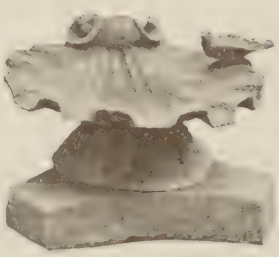

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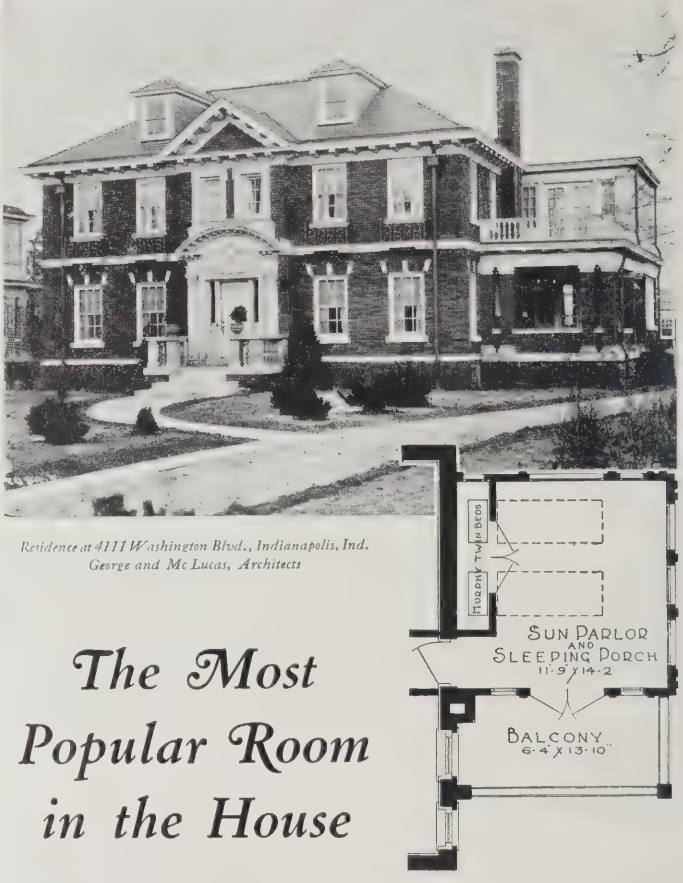

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Information on economic aspects of construction and direct service for architects on subjects allied to building, through members of THE FORUM Consultation Committee

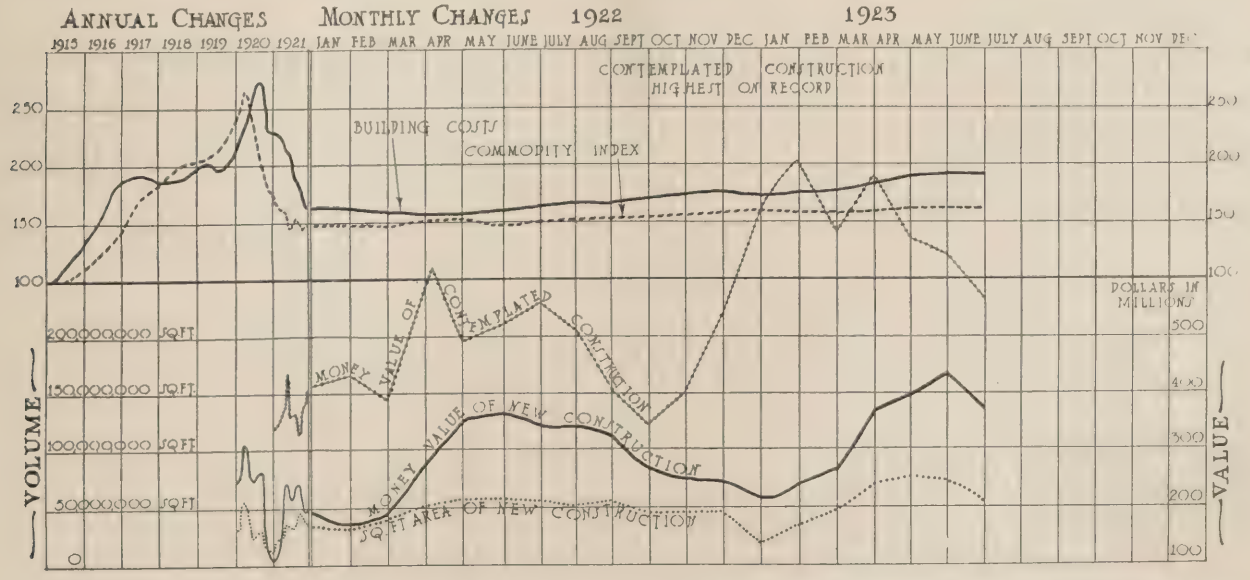
The Building Situation

THE trend of the business cycle with regard to the building situation can be predicted with somewhat more certainty now than at this time last month. The year 1923 is more like 1910 than any other year of prosperity in recent times. There was no major panic in 1910, and similarly in 1923 there will be no disastrous depression.

In June it became evident that new construction work was being somewhat curtailed, an obvious protest by building investors throughout the country against rising construction costs. The mortgage market is still comfortable enough to permit a good volume of financing, however, and there are no grounds for fearing that new construction will be stopped as extensively as in 1920. June shows only a 10 per cent drop from the volume of plans filed in May of this year for the country at large, and a 15 per cent drop for the New York district.

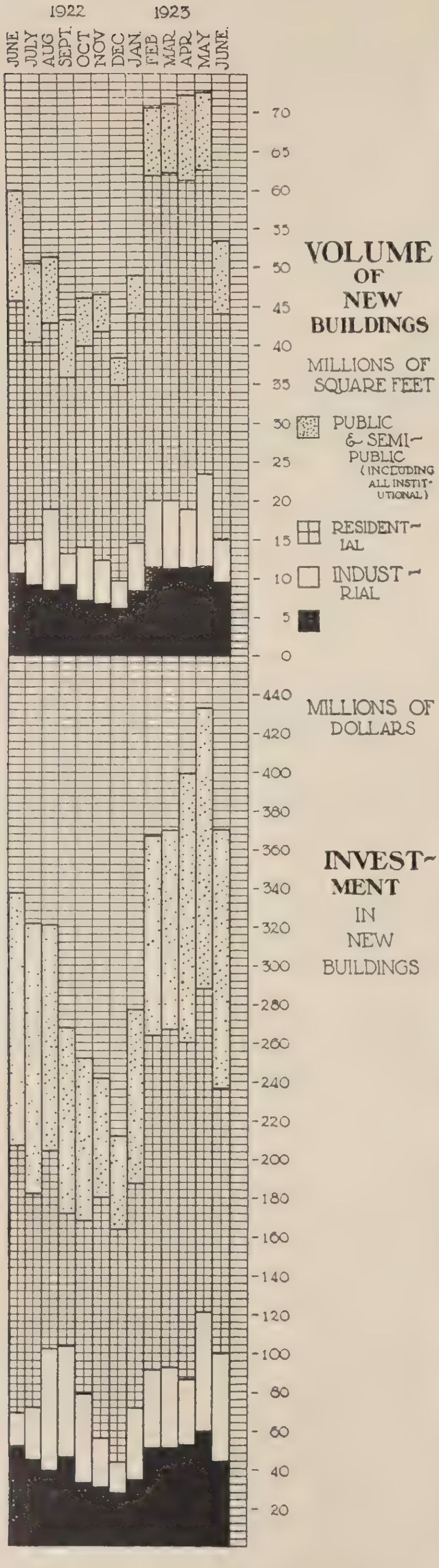
Building materials, such as brick, metals, some kinds of lumber, sand, gravel and broken stone, and a few calcined commodities are sure to fall off in price, but stability, rather than radical price reductions in both labor and materials seems to be the most probable outcome. If the credit situation can be eased somewhat during the next 12 months, conditions can be stabilized during 1924 and 1925. Other items like glass, spruce, electrical equipment, plumbing fixtures and ceramic tile, where production has not equaled demand, may not suffer price reduction.

Foreign competition, especially along the Atlantic seaboard, is beginning to play an important part. Glass, tile, brick and stone are arriving on this side in quantities sufficient to have some effect on building estimates. German brick (in American sizes) are offered to distributers in New York at $20 per M, the wholesale market price for brick now being $21. According to the Dow reports, manufacturers of some lines of roofing, lime and fireproofing materials have already taken steps to protect their customers against further mid-year price changes.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Commerce. (3) *Money Value of Contemplated Construction.* Value of buildings for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Co., and *Engineering News-Record.* (4) *Money Value of New Construction.* Total valuation of all contracts actually let. The dollar scale is at the right of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the left of the chart. The variation of distances between the value and volume lines represents a square foot cost which is determined first, by the trend of building costs, and second, by the quality of construction.

Factors of Fluctuation in Building Costs



THE above chart in the upper part indicates the approximate division of the money invested in new building, and in the lower part the number of square feet represented by new construction. Building construction is divided into four general classes, permitting the relative importance of each field to be visualized, while the total of each monthly column shows the entire volume of investment.

MONTHLY TREND OF BUILDING COSTS

Under this heading will be found each month a discussion of the trend of building costs which provides information as to the various important factors affecting its upward or downward course. Items of information as to cubic foot costs and other data of importance will be found here.

Three factors dominate the construction situation: (1) scarcity of certain basic materials and labor, which causes (2) very high cost, which is causing (3) curtailment of building. With these three factors, three others of a more general nature must be considered: (1) heavy freight traffic caused by (2) heavy production of materials to fill orders already placed. The third general factor is the uncertainty of the stock market.

As proving that present conditions remain favorable to labor, the common labor rate for the nation, as applied to pick-and-shovel men is placed at 54 cents per hour as against 53 cents last month, according to *Engineering News-Record* figures.

Local building conditions are thus reported:

Atlanta—Building continues active, with plenty of materials.

Baltimore—Scarcity of skilled building trades mechanics.

Birmingham—Scarcity of hodcarriers and common laborers, due to migration of negro labor to the north.

Boston—Plenty of building trades mechanics except common laborers and bricklayers; latter threaten strike. Construction falling off.

Dallas—Excessive demand for bricklayers; fair demand for carpenters; slight unemployment in common labor. No falling off in building construction.

Denver—Building trades 100 per cent employed.

Detroit—More men available for construction work because of slight unemployment at industrial plants. Demand for men on some jobs causing a "bidding up" of wages in special cases.

Kansas City—Shortage of bricklayers; plenty of other crafts. Structural iron workers granted higher wages.

Minneapolis— Postponement of many large building projects because of high materials prices.

Lumber

Lumber prices have continued to work lower during the past month. The mill average of yellow pine is now $34 as compared with $36 last month and the peak of $38.50 reached in May. The Douglas fir mill average dropped to $30.36 in June from $31.02 in May and $31.46 in April. There is nothing in the immediate future suggestive of a strong market, and prices should sag further. In 1921, the yellow pine mill average dropped to $19, but demand should recover sufficiently in the fall to prevent the price in the present decline going to any such low figure. After the fall trade is over, however, a further price slump is in the realms of possibility.

Lumber orders during the second quarter of the year declined from a weekly average of 241 million feet in April to 216 million feet in May and 192 million feet in June. Whereas in the first quarter orders exceeded shipments and shipments exceeded production, in the second quarter orders fell below shipments and shipments were under the output. These figures illustrate the situation:

Lumber Statistics (Millions of Feet)

1921	Cut	Shipped	Orders
1st quarter	2,752	3,242	3,305
2d quarter	3,438	3,255	2,812

Iron and Steel

Iron and steel prices continued to sag off during the past month. Pig iron at Pittsburgh is now quoted at $29.27 as compared with $30.77 last month and the recent high of $32.77. Pig iron at Birmingham is quoted at $25 against the 1923 high of $27. Steel billets at Pittsburgh are down from $45 to $42.50 This drop is not reflected in the price of structural steel, however, because finished steel prices have as yet shown no reduction.

CURRENT BUILDING TRADES WAGE RATE PER HOUR

(Higher rates indicated by +, decreases by —)

As Reported by *Engineering News-Record*

Cities	Bricklayers	Carpenters	Hoisting Engineers	Hod Carriers	Pile Drivers	Structural Iron Workers	Common Labor
Atlanta	$1.12½	$0.90	$0.70	+$0.50	......	+$0 75	$0.30@ 35
Baltimore	1.50	1 00	.80@1 00	.87½	$0.65	.80@1.00	.30@.50
Birmingham	1.00	+1.00	.50@1.00	+ 30@ 40	......	+1.25	+.30@.40
Boston	1.25	1.05	1.00@1.25	82½	+1.05	1.12½	.55@ 70
Cincinnati	1.25	1.05	1.05½	.82½	1.05	1.05	.45
Chicago	+1.25	1.15	+1.00@1.25	.88½	1.10	+1.25	.82½
Cleveland	1.40	1.25	1.25	.87½	1.00	1.25	.87½
Dallas	1.50	1.00	1.00	.40	.87½	1.00	.30@.50
Denver	1.37½@1.50	1.12½	1.12½@1.18¾	.75@.81¼	1.00	1.15½	.35@.55
Detroit	1.12½	.80	.80@.90	.50@.60	1.00	.60@.80	.50
Kansas City	1.37½	1.00	1.00@1.25	.90	1.00	+1 15	.35@.60
Los Angeles	1.25	.87½@1.00	87½@1.00	.62½	.....	1.00	.50
Minneapolis	1.12½	.87½	.87½	.71½	......	.87½	.55
Montreal	1.00	.65	.50	+.40	.50	65	+.30@.35
New Orleans	1.00	+.90	.90	.65	.80	1.00	.35@.40
New York	1.50	1.25	1.50	1.00	1.00	1.12½	.50@.75
Pittsburgh	+1.40	1.20	1.12½	1.00	......	1.25	.60
St. Louis	1.50	1.25	1.25@1.37½	1.25	+1.25	1.25	.45@.90
San Francisco	1.25	1.00	1.00	.81¼	1.00	1.12½	.50@.55
Seattle	1.12½	1.00	1.00	93¾	1.00	1.12½	.50@.62½
Philadelphia	1.37½	1.12½	1.00	.75@1.00	1.10	1 10	.50@ 65

BUILDING MATERIAL PRICES

Table Showing Average Prices Paid by Contractors for Building Materials at Local Distributing Points as of June 1, 1923. Prepared by Division of Building and Housing of the Department of Commerce from Prices Secured through the Bureau of Census

Commodity	Size or Condition	Unit	Mass. Fitchburg	Mass. Haverhill	Conn. New London	Penn. Pittsburgh	Penn. Erie	Md. Baltimore	Va. Richmond	W. Va. Fairmont	S. C. Columbia	Ga. Savannah	Detroit	Mich. Pontiac	Bay City	La. Shreveport	La. New Orleans	Waterloo	Iowa Council Bluffs	Des Moines
Common Brick		1,000	$24.00	$26.00	$32.00	$18.00	.....	$20.00	$19.00	$26.00	$12.00	$17.50	$17.50	$16.00	$15.00	$15.00	$16.50	$14.80	$16.50	$19.00
Portland Cement	Excl. of containers	Bbl.	3.25	3.50	3.68	3.10	$3.40	3.50	3.15	2.85	4.00	3.85	3.72	2.65	3.25	3.20	3.00	3.00	3.10	3.30
Yellow Pine No. 1	Dimension 2x4-16′ S1S1E	M	.....	65.00	60.00	55.00	52.00	40.00	32.00	.....	.....	30.00	50.00	50.00	50.00	49.00	41.00	54.00	50.00	50.00
Douglas Fir No. 1	Dimension 2x4-16′ S1S1E	M	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	52.00	48.00	50.00
N. Carolina Pine No. 1	Dimension 2x4-16′ S1S1E	M	.....	.....	.....	.....	52.00	.....	.....	53.00	25.00	30.00	50.00	.....	.....	.....	.....	56.00	.....	.....
Common Boards No. 1	1x6	M	55.00	48.00	45.00	54.00	51.00	.....	45.00	51.00	30.00	50.00	50.00	50.00	48.00	54.00	40.00	46.00	48.00	65.00
Y. P. Flooring E. G. "C"	1x4-10′-16′	M	120.00	102.00	135.00	83.00	110.00	140.00	125.00	112.00	100.00	55.00	.....	75.00	80.00	100.00	85.00	95.00	110.00	100.00
Douglas Fir V. G. No. 2	1x4-10′-16′	M	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	95.00	100.00	90.00
Red Cedar Shingles	Extra clear 16″ 5 to 2	100 sq. ft.	7.32	6.50	6.00	7.50	7.50	11.20	.....	7.25	.....	.....	7.25	7.00	6.00	7.00	5.80	6.50	6.80	7.50
Cypress Shingles	Extra clear 16″ 5 to 2	100 sq. ft.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.50	.....	.....	.....	.....
Composition Shingles	Crushed slate surfaced	100 sq. ft.	.....	7.50	7.00	6.50	6.50	6.00	7.50	6.25	7.00	6.50	.....	7.00	6.50	6.25	.....	7.50	8.25	6.20
Gypsum Plaster Board	⅜″	1,000 sq. ft.	.....	40.00	50.00	37.50	45.00	32.50	35.00	32.00	35.00	40.00	30.00	40.00	43.00	40.00	45.00	36.00	.....	45.00
Lime	Hyd. Com.	Ton	24.00	24.00	26.00	23.00	20.00	17.25	22.80	16.00	20.00	22.50	20.00	16.00	16.50	25.00	.....	20.00	28.00	21.00
Building Sand		Cu. yd.	1.60	2.60	1.50	2.50	3.00	2.50	2.25	3.75	1.40	2.25	2.75	1.50	2.50	2.00	2.00	1.75	3.50	1.50
Crushed Stone	¾″	Ton	3.25	3.50	2.50	6.00	3.00	4.00	.....	3.00	3.00	5.25	2.35	.....	3.50	5.40	.....	3.50	5.00	4.25
Window Glass	Single A 10″x12″	50 sq. ft.	4.80	.....	.....	5.95	.....	5.10	5.80	4.90	6.25	.....	4.80	.....	5.40	4.25	4.20	5.25	.....	4.80
Hollow Tile	8″x12″x12″	Each	.30	.30	.....	.21	.19	.24	.23	.26	.20	.....	.19	.18	.21	.22	.22	.17	.14	.15
Cast Iron Soil Pipe	4″ E.H. 13 lbs. per ft.	Ton	.....	.....	.....	68.00	.....	82.60	.....	85.00	.....	.....	61.23	53.00	84.50	97.00	.....	82.00	.....	128.00
Steel Pipe	1″ galv.	100 ft.	.....	.....	.....	9.86	.....	10.10	.....	10.50	11.80	9.46	10.71	9.00	9.75	11.95	.....	12.00	.....	11.26
Reinforcement Bars	¾″ square	100 lbs.	3.75	4.75	.....	4.00	.....	3.50	3.75	3.50	4.50	5.00	3.45	3.50	3.75	4.50	3.75	4.00	3.40	3.45
Structural Steel	Fab. 6″ I-beams	100 lbs.	4.25	3.75	.....	3.75	.....	3.50	4.50	6.00	5.00	5.00	8.00	4.50	4.65	5.00	5.50	4.95	4.50	3.92
Gypsum Plaster	Neat	Ton	.....	27.00	26.00	22.00	24.00	21.50	.....	19.00	20.00	22.50	17.00	17.00	18.00	24.00	21.00	18.00	18.00	19.00
Roofing Slate	No. 1 Ribbon	100 sq. ft.	.....	.....	.....	13.50	.....	.....	13.50	13.00	.....	.....	.....	17.00	17.50	12.00	.....	18.00	.....	.....
Tar Paper Roofing	2-ply 75 lbs. per roll of	100 sq. ft.	.....	.....	.....	1.95	.....	3.75	.....	.....	.....	1.90	2.10	2.75	2.80	2.25	2.00	3.25	3.60	2.85
Rosin Sized Sheathing	3-ply 30 lbs. per roll of	500 sq. ft.	.....	1.60	1.60	1.35	1.30	1.45	1.50	1.25	.....	1.00	1.20	1.00	1.10	1.25	1.85	1.50	1.50	2.00

Commodity	Size or Condition	Unit	N. Y. Buffalo	N. Y. Rochester	Mo. Kansas City	Mo. St. Louis	Ohio Cleveland	Ohio Akron	Ohio Toledo	Ohio Lorain	Ohio Dayton	Ohio Hamilton	N. Dak. Grand Forks	Texas San Antonio	Ariz. Tucson	Calif. Sacramento	Calif. Los Angeles	Wash. Seattle	Wash. Spokane	Ore. Portland
Common Brick		1,000	$23.00	$17.75	$16.50	$18.50	$16.00	$18.00	.....	$23.50	$18.00	$25.00	$15.00	$17.00	$15.00	$17.00	$15.00	$20.00	$18.00	$20.00
Portland Cement	Excl. of containers	Bbl.	3.03	3.35	2.45	2.85	3.48	3.50	.....	3.60	3.60	3.20	4.00	3.60	4.40	3.55	3.26	3.10	3.40	3.65
Yellow Pine No. 1	Dimension 2x4-16′ S1S1E	M	49.00	48.00	50.00	41.50	60.00	45.00	$49.00	55.00	57.50	53.00	.....	57.00	.....	.....	.....	.....	.....	.....
Douglas Fir No. 1	Dimension 2x4-16′ S1S1E	M	55.00	56.00	50.00	47.00	.....	.....	.....	.....	57.50	.....	56.00	.....	65.00	46.50	49.50	25.00	27.00	24.00
N. Carolina Pine No. 1	Dimension 2x4-16′ S1S1E	M	.....	48.00	.....	.....	.....	.....	.....	.....	52.50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Common Boards No. 1	1x6	M	45.00	45.00	60.00	51.00	52.00	50.00	.....	50.00	70.00	75.00	53.00	66.00	62.50	48.00	48.00	25.00	31.00	24.00
Y. P. Flooring E. G. "C"	1x4-10′-16′	M	72.00	130.00	65.00	87.00	102.00	.....	95.00	110.00	.....	90.00	.....	120.00	.....	.....	.....	.....	.....	.....
Douglas Fir V. G. No. 2	1x4-10′-16′	M	105.00	.....	.....	.....	.....	.....	.....	.....	90.00	.....	100.00	.....	100.00	83.50	87.75	60.00	80.00	57.00
Red Cedar Shingles	Extra clear 16″ 5 to 2	100 sq. ft.	6.00	6.25	6.50	6.25	6.00	6.00	6.20	6.40	6.20	6.40	6.00	6.80	.....	5.65	5.88	3.65	.....	5.00
Cypress Shingles	Extra clear 16″ 5 to 2	100 sq. ft.	.....	.....	.....	.....	.....	.....	.....	.....	6.50	.....	.....	.....	7.00	.....	.....	.....	.....	.....
Composition Shingles	Crushed slate surfaced	100 sq. ft.	.....	.....	6.00	6.30	6.25	.....	6.50	.....	6.50	7.00	.....	.....	.....	.....	.....	.....	.....	.....
Gypsum Plaster Board	⅜″	1,000 sq. ft.	45.00	30.00	35.00	42.50	32.00	27.60	.....	.....	50.00	50.00	60.00	.....	.....	41.50	45.00	34.00	.....	50.00
Lime	Hyd. Com.	Ton	16.00	21.00	25.60	20.00	18.00	20.00	20.00	17.50	15.20	20.00	.....	18.00	23.00	.....	25.00	22.00	.....	26.00
Building Sand		Cu. yd.	1.28	2.25	2.50	2.65	2.50	1.90	.....	3.15	2.00	2.20	3.00	2.25	1.15	1.50	1.60	1.75	.....	2.25
Crushed Stone	¾″	Ton	1.30	2.25	2.25	.....	3.50	3.25	3.00	2.65	2.00	1.50	.....	2.00	3.00	2.75	2.15	2.00	.....	.....
Window Glass	Single A 10″x12″	50 sq. ft.	4.20	4.20	4.50	4.50	.....	6.00	.....	.....	4.50	6.50	.....	4.50	.....	.....	5.10	4.42	.....	.....
Hollow Tile	8″x12″x12″	Each	.22	.21	.22	.....	.....	.19	.....	.19	.21	.20	.....	.25	.18	.....	.19	.25	.....	.....
Cast Iron Soil Pipe	4″ E.H. 13 lbs. per ft.	Ton	90.55	100.10	.....	.....	.....	95.75	.....	.....	.....	100.10	88.00	120.00	.....	.....	.....	115.50	122.00	112.02
Steel Pipe	1″ galv.	100 ft.	10.00	10.52	.....	.....	.....	10.36	.....	.....	10.57	10.38	13.80	11.12	13.25	.....	12.30	12.50	.....	16.50
Reinforcement Bars	¾″ square	100 lbs.	.....	3.60	.....	3.48	.....	4.00	.....	3.35	6.00	3.75	5.70	4.15	4.50	.....	3.55	3.00	.....	4.00
Structural Steel	Fab. 6″ I-beams	100 lbs.	.....	4.50	.....	5.10	.....	3.50	.....	3.10	3.25	4.75	5.70	4.50	.....	.....	8.00	5.00	.....	9.00
Gypsum Plaster	Neat	Ton	17.00	18.00	.....	18.00	.....	19.00	.....	19.20	18.00	18.50	27.00	24.00	21.00	.....	.....	21.00	.....	24.00
Roofing Slate	No. 1 Ribbon	100 sq. ft.	.....	.....	.....	.....	.....	13.00	.....	.....	15.00	18.00	.....	18.00	.....	.....	.....	.....	.....	30.00
Tar Paper Roofing	2-ply 75 lbs. per roll of	100 sq. ft.	2.00	1.80	.....	.....	2.50	2.80	.....	.....	1.80	2.00	3.00	3.50	2.90	.....	2.25	2.50	2.82	.....
Rosin Sized Sheathing	3-ply 30 lbs. per roll of	500 sq. ft.	1.50	1.50	1.20	1.23	.90	.95	.....	.....	2.00	1.25	2.00	2.25	1.75	.....	1.50	1.20	1.22	1.80

THE FORUM CONSULTATION COMMITTEE

A group of nationally known experts on various technical subjects allied to building, providing a direct service to architects

THE editors of THE ARCHITECTURAL FORUM have been fortunate in obtaining the co-operation of the following recognized experts who constitute THE FORUM Consultation Committee. This Committee provides a service of the greatest value to subscribers in addition to the usual editorial service, and architects who seek information on specific questions in these various fields are invited to present inquiries.

The basis on which this Committee has been organized is:

(*a*) That each committee member shall be a representative leader in his line;
(*b*) That no committee member has affiliations with any manufacturer;
(*c*) That no committee member will be called upon for detailed service excepting by special arrangement;
(*d*) That a special editorial article on a subject represented under each of the headings below shall be prepared during the year by the committee member.

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Comptroller, Metropolitan Life Insurance Co.

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Service Engineer, American Gas Association

A specialist in problems pertaining to gas service and its use in all classes of buildings and industries.

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DANIEL P. RITCHEY

Known in the hotel field as the "hotel doctor." Mr. Ritchey, who is an engineer as well as an experienced hotel owner and manager, is qualified to answer any questions which may arise in this connection.

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CHARLES A. FULLER
Consulting Heating and Ventilating Engineer

Member of firm of Griggs & Myers, New York. Widely experienced in the field of heating and ventilating design for office buildings, institutions and industrials; specialist on investigation and report work on mechanical equipment for new and old plants.

ELECTRICAL SCIENCE

WILLIAM L. GOODWIN
Assistant to the President and in charge of activities of the Society for Electrical Development

This Society is organized to promote accurate knowledge of the practical application of electricity. Its activities extend from the simple problems of household equipment to highly developed electrical plants. Particular attention is given the development of provision for electrical service in buildings.

SAFETY ENGINEERING

S. J. WILLIAMS
Secretary and Chief Engineer, National Safety Council, Chicago

Safety engineering is an important factor in the design of buildings where large groups of people congregate. The National Safety Council has investigated construction and devices with the greatest minuteness.

FARM SCIENCE

FREDERICK WALTER IVES, B.S., M.E.

Professor and Head of Department of Agricultural Engineering, Ohio State University. Consulting Agricultural Engineer, Columbus, Ohio.

Specialist in land drainage, soil improvement, surveys, farm arrangement for economical production, purchase of equipment and economical layout of farm buildings with special reference to interior arrangement.

Address inquiries to committee members, care THE ARCHITECTURAL FORUM, 103 Park avenue, New York

THE FORUM DIGEST

A SURVEY OF IMPORTANT CURRENT ARTICLES ON BUILDING ECONOMICS AND BUSINESS CONDITIONS AFFECTING CONSTRUCTION

The Editors of this Department select from a wide range of publications matter of definite interest to Architects which would otherwise be available only through laborious effort

"A MENACING CONDITION IN THE BUILDING INDUSTRY"

THE Guaranty Trust Company of New York in the current issue of *The Guaranty Survey* raises some interesting points. While this publication represents the viewpoint of a large banking organization closely in touch with the general economic development of the country, it may be said that this article shows in many instances a lack of close contact or a thorough understanding of the building industry and the building situation. In view of the fact that this general subject is one of great interest in architectural circles today, and because some of the comments provide interesting information and data, we reproduce the entire article:

That the particularly threatening situation in the building industry has been so generally recognized is cause for gratification. Concerted efforts are being made by representatives of the several interests most immediately concerned to bring about a reasonable degree of stabilization in this industry. If they succeed, the resulting benefits will be shared by all classes of business.

Some effects of these efforts are seen in the postponement or abandonment of contemplated undertakings which had not been contracted for. In addition, considerable work that had reached the contract stage has been deferred, and in some cases work already under way has been suspended. No immediate marked recession in material or labor costs, however, was to be expected. A large volume of really urgent construction is under way, and the momentum of construction activity in a period of generally sustained prosperity precluded the probability of a collapse of prices in response to such moderate relaxation in demand. Inasmuch, however, as the primary aim of the various elements represented in the movement to forestall a breakdown in the industry is stabilization, with a view to its wholesome effect upon the general business situation, the stability of prices of the principal building materials in recent weeks is in line with the objects sought.

Building is a key industry, and upon conditions in this field depends in large measure the probability of sustained business activity in general. Products of forests, fields, mines and quarries, the fabrication, transportation and assembling of these products, and the equipment and furnishing of completed structures — altogether these affect more or less directly practically every branch of industry. The willingness of representatives of the various interests most directly concerned, including producers and distributors of materials, contractors, owners, credit institutions and workingmen, to co-operate in a program for stabilization is noteworthy. This collective action is significant, not merely because of its immediate salutary influence upon business, but because of its potential contribution to a long-time constructive program for mitigating or preventing the economic distress resulting from recurrent periods of business depression. Here may be provided a demonstration on a large scale of the ability of present-day economic organization, where foresight is coupled with courageous action, to escape some of the usual untoward consequence of business expansion.

Effects of Building Shortage

From the outbreak of the war, and not merely after the entrance of the United States, the volume of building began to sag below its customary level. From 1917 to 1921 the shortage grew rapidly, although 1919 and 1921 were characterized by considerable increases in construction activity. Not until the spring of 1922 did the deficiency begin to be reduced. In so brief a period as has elapsed since, only a fraction of the shortage could be overcome. The extent of the shortage cannot be precisely measured. Various estimates indicate that at the beginning of this year the building deficit represented about two years' normal construction, which would cost say $2,000,000,000 at pre-war prices.

With the general lack of sufficient housing so pronounced after the depression of 1920, the revival of activity in building antedated the upturn in business as a whole, and in intensity of activity this industry has continued well above the average for other lines of business. In other words, the response to the urgent need for new construction not only hastened the recovery from business depression, but has remained a major factor in the continuance of a high scale of general activity.

The scarcity of housing has contributed both directly and indirectly, however, to the lack of equilibrium in wages and in prices which constitutes now a fundamental obstacle to sustained prosperity. Inadequacy of housing facilities lies back of the continued rise in rents, which in turn has increased the pressure for higher wages.

The index of the cost of living compiled by the United States Department of Labor shows, for 32 representative cities in March, a further increase in rent. For that month, the cost of housing was 62.4 per cent above the 1913 average, representing an increase somewhat less than the rise in the cost of living as a whole, which was then 68.8 per cent above the pre-war average. Instead of reducing rentals, the rush of activity in providing new housing has possibly helped to raise them, owing to excessive construction costs.

Building Costs Out of Line

The building situation illustrates the unstable conditions resulting from disproportionate prices or wages. Average prices of lumber and building materials in May, as shown by the Department of Labor's index of wholesale prices, were 102 per cent above the 1913 average, while the all-commodities average was 56 per cent above the pre-war level. In 12 months the advance in prices of building materials was 26 per cent, and in the all-commodities average, 5 per cent.

A similar comparison of wages in the building trades at different periods with wages in other industries is not easily made. In many cases the wages actually paid differ widely from the nominal scales. Reported wages in the building trades indicate that, for the country as a whole, wage rates have not risen as much as the prices of building materials since 1913, and that they are now only about 75 per cent above the pre-war rates, as compared with the 102 per cent increase in prices of materials. Wages, however, are but little below the peak reached in 1920, while prices of building materials are a third lower than they were at their peak. But labor cost is not measured solely by the wage rates. Reduced efficiency under conditions such as have recently developed in the building industry is a significant factor in the total cost of construction.

The high wages of the building trades reflect the relative or absolute decline in the numbers of workers in certain of these trades. From 1910 to 1920 there was an increase of 9 per cent in the total number of persons 10 years of age and older reported by the census as gainfully occupied. For some building trades there was corresponding or even larger growth in numbers. For example, the increase in the number of carpenters reported was 9 per cent, and of plumbers and gas and steam fitters, 39 per cent. In other trades, however, there was a

decline. The number of brick and stone masons and cement finishers in 1920 was 18 per cent less than that reported in 1910. Other declines were: of painters, glaziers and varnishers, 9 per cent; of plasterers, 20 per cent; and roofers and slaters, 19 per cent.

In part, the indicated declines may be explained by the fact that the census enumeration in 1920 was as of January 1, whereas in 1910 the census date was April 15. Owing to the seasonal character of much building activity, probably some who would have been reported as engaged in a building trade in April were not so reported in January. It is improbable, however, that the difference in dates accounts fully for the reduced numbers reported in 1920. And it appears that in some of the trades there are even fewer workers now than in 1920.

Construction costs as a whole, including wages and cost of material combined, are nearly double the 1913 average, and about one-fourth below the peak reached in 1920. They have risen about 20 per cent since April, 1922. The enormous gain in projected building in the first third of the year as compared with the corresponding months of last year threatened a drastic reaction in the industry, for it was apparent that the volume of construction planned, in view of the capacity of material producers and the available labor, would accentuate the tendency toward prohibitive costs.

Organized Control Attempted

Among the earliest pronouncements regarding the situation to attract nation-wide attention was the letter of Secretary Hoover, on March 17, to the president, in response to the latter's request for suggestions as to the administration's building policy. In this letter Secretary Hoover recommended that the government should initiate no new construction work save that most urgently necessary, and that there should be a slowing down of the public work in progress until after a relaxation in private demands.

The Board of Governors of the American Construction Council, representing the various factors in the construction industry, issued a statement a few weeks later again calling attention to the growing menace of rapidly rising costs and the attendant speculation, duplication of orders, and decreased efficiency of labor.

Remedial measures proposed included speeding up of production and transportation of materials and elimination of useless restrictions upon labor output, on the one hand, and relaxation of demand for early construction on the other. It was recognized that only limited relief through measures affecting the supply of materials and labor output was possible. But the hope was expressed that the dissemination of information as to costs, restriction of loans for speculative building, and curtailment of speculation in materials might help to confine activity in the near future to the most necessary undertakings, thereby introducing a needed element of stabilization in the industry.

The postponement of a considerable volume of projected construction, public and private, an earlier and more pronounced decline in permits for new construction than usually occurs in the spring, a steadying of building material prices, and a more conservative policy on the part of some institutions financing building projects, all indicate that in appreciable degree the needful restraint in the industry is already being exercised.

Helpful Co-operation

An example of the benefits which may be expected to result from a recognition of the common interests involved in a program of stabilization through co-operation is seen in a local wage agreement. The associated employers and the union agree to 'exercise the utmost discipline possible' to prevent the practice on the part of employers of offering, in order to secure workmen, higher wages than those provided for by agreement, and the practice on the part of workmen, individually or collectively, of demanding, before accepting employment, higher wages than those provided by agreement.

The formal acknowledgment that the practices mentioned are 'demoralizing to the association and to the union' states a fact which has been repeatedly demonstrated. To demonstrate also that such practices can be prevented by the parties directly concerned would lead toward elimination of a major obstacle to stability in the industry.

The organized efforts now being made to forestall a threatened sharp reaction in the building industry emphasize the need for constructive action that may have a stabilizing influence of a permanent character, as well as for the present emergency.

A more nearly even distribution of building operations throughout the year, for example, is desirable. Labor costs especially are increased by the seasonal lay-off or part-time activity. Climatic conditions preclude, of course, an entirely even distribution of activity, but extreme fluctuations could be reduced. Much indoor work that could be done in winter is undertaken when the pressure upon labor and material supplies is greatest. In the larger centers, renting contracts for residential occupation are so timed as to accentuate the peaks of activity. In many cases, no doubt, the costs which a uniform 'moving day' entails outweigh its supposed advantages.

Some of the limitations upon apprenticeship and upon the output of workers in the building trades are harmful; they run counter to the long-time interests of the workers themselves. If the present emergency results in making this fact more generally understood and in the partial elimination of such abuses, there will be a gain for every interest concerned.

The greatest benefit to be expected, however, from a reasonable degree of stabilization in the building industry at this time would be its demonstration that prosperity and generally intense activity in other lines of industry as well may be so controlled by voluntary action as to avoid a culmination in sudden collapse and a subsequent depression.

SIGNS OF STABILIZATION IN THE NEW YORK BUILDING SITUATION

AN announcement recently by the United States Realty and Improvement Company that it was again in the market for new construction business, and a general improvement in the building labor situation reported by this and other large construction companies has given a reassuring tone to the building industry as a whole.

While in some quarters there was a tendency to confine this optimism to the labor situation, officials of several large construction companies agreed that the conditions which caused a temporary abandonment of several large building projects last May had shown sufficient improvement to warrant carrying out plans for future construction.

The announcement by the United States Realty and Improvement Company followed a conference of the directors and the managers of its subsidiary, the George A. Fuller Construction Company, who came here from different parts of the country. It was said that, whereas the company had decided 60 days ago not to take any additional building orders, the improvement in the labor field and stabilization of wages had prompted the directors to take new contracts with confidence that they could be carried out with reasonable profits to the company.

Ready to Make Contracts

The Fuller Company at present has approximately $18,000,000 worth of construction on its books throughout the country and about $6,000,000 worth of building in progress in New York. An official of that company said that the company was willing now to give prospective builders a contract price based on prevailing costs for both labor and material. This, he said, had not been possible for the last two months or more.

"We interpret the market to mean stabilized costs at the present level," he said. "These costs, in some instances, are lower. Labor is back on the job, and we are not anticipating further trouble in this regard. With the agreements reached in May, wages were increased $1 a day in some cases, and others from $1 to $4, including bonuses. These bonuses average $2 a day in the bricklayers' trade.

"All trades are working now, and there is a tendency toward a greater supply of workers. There is no surplus now, but it is probable there will be by the first of next year. The last survey of the Building Trades Employers' Association showed that about 50 per cent of the speculative apartment house construction would be completed by Aug. 15. The completion of this work will release many mechanics for other construction.

"Another factor in the improvement has been the publicity which has attracted workers from outside the city. There seems no reason why there should not be abundant labor by next Jan. 1."

Delay in Getting Materials

At the offices of the Thompson-Star-

rett Company it was said that the company has in course of construction approximately $40,000,000 worth of building, all of which is going ahead without serious interruption. An official remarked that there was a downward tendency in the cost of steel and lumber. The only delays, he said, are caused by failure to get materials delivered promptly. The company is in the market for new contracts.

R. H. Shreve of Carrere & Hastings, architects, was of the opinion that the only relief in the building situation was to be seen in the decreased volume of construction.

"We are going at a moderate rate of speed, that's all," he said. "There is no more labor than there was, but there is more labor for the amount of construction now under way."

A NEW SERVICE AVAILABLE TO ARCHITECTS IN PLANNING OFFICE BUILDINGS

NEW and valuable ideas in the construction of office buildings have been developed by the new Building Planning Service Committee of the National Association of Building Owners and Managers, the reports of which, in connection with the completion of its first commission, are now available.

The committee is headed by Earl Shultz of Chicago, president of the National Association, and on the personnel are experts from New York, Boston, Cleveland, Detroit, Chicago and other large cities where the construction of office buildings constitutes an important phase of the building industry.

The first commission of the committee was received from S. W. Straus & Co. to analyze the plans of their new $14,000,000 building now being erected at Michigan and Jackson boulevards, Chicago. The committee remained in conference for two days, and went over every detail of the new Straus Building from the sub-basement to the top of the tower. Many valuable suggestions were offered by the building managers, who were able through their years of experience in the highly specialized field of building management to judge the building from the manager's point of view rather than from the standpoint of the architect or owner.

Recommendations were made by the building managers which will mean a saving in construction of more than $250,000. This was done in spite of what were already considered perfect plans for the Straus Building. Recommendations were made for changing entrances and first floor plans, the location and arrangement of toilet facilities which will probably add about 300 square feet of office space on each floor to be occupied by tenants, and for extra rentable area opposite the elevators by the elimination of the setback on the upper stories of the south side of the large light court. The changes as suggested may add nearly $22,500 per year to the rental income, of which a large portion will represent net profit to the building for the reason that it will require a very slight increase in operating cost to maintain the space gained, inasmuch as it was so evenly distributed throughout every section of the building.

The uppermost thought of these building managers was to cut down the margin of unrentable area of the building, thus enabling a saving in operation expenses and providing a maximum of income for the building and owners. Parallel to this thought was the order that wherever possible service to the tenant was to be enhanced through better and more efficient space and through improvement in facilities for those having executive offices, as well as for the hundreds of men and women who daily would make the new Straus Building their working headquarters.

This building conference, representing a new order of business in office or any other type of building construction, was not conceived to supplant the work of architects in the layout and design, but merely to supplement ideas for increased service and efficiency, from the standpoints of both owner and tenant.

In explaining the formation and work of the Building Planning Committee, Chairman Schultz asserted that present building costs necessitate construction that will make possible the operation of buildings at the highest possible efficiency. For that reason, the committee of experts was formed to assist not only owners, but architects as well.

"A survey made by the Building Owners and Managers' Association last year," said Mr. Shultz, "revealed that only 70 per cent of the floor space of modern buildings was rentable. It is our belief that the margin of unrentable area can be cut down to a great extent."

The Building Planning Service Committee, which is now available to owners who contemplate new building throughout the country is, in addition to Mr. Shultz, chairman, composed of: Clarence T. Coley, Equitable Building, New York; W. H. Ballard, manager of several large buildings in Boston, including the Chamber of Commerce Building; W. M. MacLachlan, Penobscot Building, Detroit; M. S. Halliday, associated with the construction of the Union Trust Company of Cleveland; Louis T. Clark, manager of the Wright & Callender Building, Los Angeles, and Lewis B. Ermeling, secretary of the National Association.

This committee, according to Mr. Shultz, will do everything possible in the interests of efficiency and economy in office building construction. He said this service was destined to become one of the greatest assets to owners, architects, engineers, investment bankers and mortgage loan firms engaged in the construction and operation of new office buildings. It assures the owner that he will receive the greatest possible income from his new building through the service of the Building Planning Service of the National Association.

S. J. T. Straus, senior vice-president of S. W. Straus & Co., in approving the work of the National Association of Building Owners and Managers, in creating this Building Planning Committee to co-operate with builders, said:

"This meeting of the Building Planning Committee, which I understand is the first of its kind ever held in the history of skyscraper construction, has been a distinct success, and has undoubtedly saved our company many thousands of dollars. I heartily endorse both the principle and its application, and congratulate the National Association of Building Owners and Managers on the conception of an idea which will contribute materially to the advancement of efficient and sound office building construction."

Architects who are interested in taking advantage of this service may obtain further information by addressing THE ARCHITECTURAL FORUM, or the Building Owners and Managers' Association, Chicago.

BETTER LIGHTING FOR SCHOOLROOMS

THE lighting, building, education, health, and social agencies of the country have joined hands in an effort to develop a nationally accepted code for school lighting which will correct the conditions partially responsible for the defective vision of 10 to 20 per cent of the school children. The formulation of this code is being carried on under the auspices of the American Engineering Standards Committee, a federation of national organizations, government departments, and other agencies interested in standardization, whose official approval of a standard or code insures its ultimate acceptance by the principal interests concerned. The conditions that make such a code necessary have been summarized thus by a committee of the Illuminating Engineering Society:

"Examinations of thousands of school children, extending over many years, have shown that from 10 to 20 per cent of the children suffer from defective vision, the result largely of continued use of the eyes in close work under unhygienic conditions. It is well established that defective vision is progressive, and is therefore found to a larger extent among the older children. Many of the factors contributing to defective vision of children are closely connected with school life, and to this extent the causes are preventable and may be removed. Modern educational methods impose severe requirements upon the immature eyes of children, and create the need for the very best working conditions. It is therefore essential that the lighting, both natural and artificial, of school buildings, should be of the best design. The status of illumination is so well established that it is entirely feasible and practicable to prevent eyestrain by the proper design of school buildings and the installation of suitable lighting equipment.

"Economically, it is found that, in general, children with defective vision are retarded in their progress in school life, and also enter upon their life work seriously handicapped. It is right, therefore, that a state should concern itself to protect and conserve the vision of children from an economical, as well as humanitarian, standpoint."

The American Engineering Standards Committee has appointed the American

Institute of Architects and the Illuminating Engineering Society joint sponsors for the code on school lighting. The sponsors will organize a representative sectional committee to formulate the code, and will provide for the publication of the code after it has been approved by the A. E. S. C.

The organizations that are already co-operating in this work are the:

American Gas Association.
American Institute of Architects.
American Institute of Electrical Engineers.
American Public Health Association.
American Society of Safety Engineers.
American Medical Association.
Illuminating Engineering Society.
National Committee for the Prevention of Blindness.
National Bureau of Casualty and Surety Underwriters.
National Education Association.
U. S. Bureau of Education, Department of Interior.
U. S. Public Health Service, Treasury Department.
U. S. Women's Bureau, Department of Labor.
U. S. Bureau of Standards.

SECURING APPRENTICES

FEW shortcomings in our industrial system are more deplorable in their effects than the discouraging of the recruits urgently needed by all the trades which enter into building. It is far easier to lament lack of recruits than to form some plan for recruiting the service and making it sufficiently attractive to induce young men to enter it, but this is being done in Boston, and from the *Boston Evening Transcript* we quote several paragraphs from its survey of the subject:

"An Apprenticeship Commission has been authorized by the Building Trades Employers' Association, the Building Trades' Council and the Boston Building Congress which have co-operated with each other in the preparation of plans. The commission has not yet been appointed, but will be named shortly. It is to be composed of nominees from the three organizations, and will have in its membership representatives of labor, contractors, sub-contractors, architects, engineers and material interests.

"The basis of this apprenticeship programme for the industry is voluntary co-operation. There is nothing mandatory in the powers of the commission, nor could such a commission be given mandatory powers because it would be undesirable as well as impossible to impose upon a skilled trade an apprenticeship system which did not have its support.

"It would seem impracticable for such a commission to do more than lay out a general plan of procedure and maintain general supervision over its operation. Responsibility for making such a plan effective in each trade should lie with the trade itself. In order to facilitate the necessary co-operation between the separate trades and the commission there should be in each trade a committee on apprenticeship, on which the representatives of the mechanics and the employers can co-operate for the establishment, operation, control and regulation of standards and instruction for the apprentices of that trade, under the general direction and supervision of the commission on apprenticeship. Thus all trade committees would operate consistently with the general plan, and all apprentices would have the same opportunities for adequate training conditioned in each case on the needs of the particular trade.

"There are various methods by which apprentices may be developed into skilled mechanics, and various agencies available to assist in this process. It should be the duty of the commission on apprenticeship to develop the best use of these resources. It is the opinion of this committee that thoroughly trained mechanics will best be developed through practical training on construction work, or in the shops related thereto, with parallel instruction in the necessary theoretical and technical branches of their training.

"In developing an apprenticeship system in any trade, there are many practical problems to be solved and conditions to be defined, as well as mutual obligations of apprentices, employer and labor groups to be established. This outline of such matters may serve as a guide to those who may be entrusted with the development of such a system:

Enrollment of apprentices with the special apprenticeship committee.

Identification of apprentices in the trade or at work.

Probationary period.

Maximum and minimum age for apprenticeship.

Term of apprenticeship.

Divisions of apprenticeship into periods for advancement.

Periodic examination of apprentices.

Granting of advanced credit to apprentices for previous experience in the trade.

Transfer system for interchange of employment.

Apprentice wage by periods at work and in school.

Overtime limits.

Hours per week at work and in school.

Determination of time for school attendance.

Enforcement of school attendance by employers and by unions.

Apprentice fees.

Determine upon classification of apprenticeship for the trades within the jurisdiction of the apprenticeship committee.

Statement of trade processes to be taught apprentices in each such classification at work and in school.

The apprentice must have the opportunity provided for him to obtain all-around experience while he is at work.

Approve courses of study to be taught apprentices in school instruction, including technical studies related to the trade in which they are employed and training for citizenship.

Supervision of apprentice at work and in school.

Periodic reports on apprentices to the apprenticeship committee from work and from school.

Regulation of adjustments for employer and for apprentice.

Minimum ratio of apprentices to journeymen.

Approval of employer, indicating that his work is sufficiently varied and equipment sufficiently complete to give the apprentice the required diversity of trade experience to cover the trade classification; his ability to provide continuous employment to the apprentice during his apprenticeship period subject to conditions not under control.

Special regulations as may be necessary.

Agreement by apprentice to abide by rules established.

Granting of diploma upon termination of apprenticeship.

The definite provision of classes in school for the instruction of apprentices."

BUILDING HEIGHTS

LIMITATION of city building heights by law seems to be in an epidemic stage at the moment. Half a dozen cities have concerned themselves with the question in recent months. Their conditions are quite different, and the apparent motives of the height limitation movement are just as various. In one or two cities the protection of a particular building or street appears to be at issue, while in others the objective is more general. In still other cases no immediate motive is apparent. Except in one case, it is proposed to restrict the height of future building to a lower point than the owner's or architect's choice would fix. The exception is Boston, where existing height limits on a particular street are to be raised in order to permit better utilization of the land. Nowhere, however, has substantial reasoning been brought to bear on the problem. So far as can be judged, æsthetic notions are leading factors in the discussion — a belief that high buildings are unsightly in themselves or are harmful to neighbors, or the vague notion that civic beauty lies in a uniform sky line. Such beliefs do not appeal very strongly to the general run of men, and the successful development of tall buildings in both isolated and row arrangements, and the strong demand for space in them, are practical answers to many of the claims made by those who advocate restriction. Transportation difficulties, or other real objections arising out of the intense concentration of population which high buildings produce, have almost never been made an argument in height limitation, nor have they been studied with due care to determine their bearing on the problem. In cities of large size and great concentration of business these difficulties and objections are serious,— though just how serious is somewhat uncertain,— while in smaller cities they are substantially non-existent. In the meantime the æsthetic discussion of high buildings remains largely a matter of diverging personal views, and the skyscraper has rapidly become a feature of even the smaller country metropolis, where for many decades to come such matters as zoning and setbacks can have no meaning. Until a full and convincing study of the relation of the skyscraper to community life and to the rights of different parties has been made, it is not likely that the height restriction movement will progress beyond the condition of breaking out in an occasional epidemic, as at present.—*Engineering News-Record.*

BOOK DEPARTMENT

DETAILS OF THE ARCHITECTURE OF TUSCANY. Photographs and Text by Harold Donaldson Eberlein. Measured Drawings by Oliver Reagan. 10 x 13½ ins. $15 in cloth; $12.50 in portfolio. William Helburn, Inc., New York.

WIDE and growing popularity in America of the Italian architectural styles is leading to the close study of these types at first hand. Writers and architects have now explored every part and corner of Italy, going into the bypaths as well as traveling the well beaten roads of the tourists, and the result of their work with pen, camera and pencil serves to widen and strengthen the appeal which the Italian styles exert as well as to make more simple their correct interpretation in America.

In a land such as Italy, divided as it is into various provinces, there are found countless regional types of architecture. This was perhaps even more true during the early renaissance period when these styles were in their formative stages, for then the peninsula had not achieved political unity, and each province and to some extent each city existed as a little world to itself in which architectural styles, the customs and dress of the people, and even dialects were individual and peculiar to each region. Even now when all Italy has been brought into one political unit and when changed methods render intercourse between different sections a matter of no difficulty, these regional types persist, adding to the variety which study of Italian architectural types presents.

With a number of Italian styles from which to choose, American taste generally selects the architectural types prevalent in central or northern Italy, and especially the forms identified with Tuscany. This type, more than some of the others, presents that freshness, crispness and simplicity which are so winning in the Italian types, and yet allows for the due use of ornament when ornament is desirable. The style presents endless opportunity for the exercise of skilled craftsmanship in the forms of sculpture, mural painting, forging of metal and the inlay of woodwork of different sorts, and yet all this abundance of ornament is never permitted to give an appearance which is complicated or fussy. Ornament is valued as an aid or accessory to architecture, but is always kept within its place and not permitted to overstep the bounds and become so important that architecture becomes merely a vehicle for the carrying of ornament.

The Brunelleschi Cloister
Santa Croce, Florence
Illustration from "Details of the Architecture of Tuscany"

In this volume there are presented illustrations and drawings which are of great value in furthering the correct use in America of the Italian architectural and decorative types. The authors of this work have wisely fixed their attention upon buildings of a more or less domestic nature and of a comparatively simple character, —just the type, in fact, in which American architects and decorators are chiefly interested. This includes villas, minor palaces which are practically villas, and the domestic buildings of certain conventual establishments. From structures of all these kinds Mr. Eberlein's camera and facile pen have gathered countless details which are presented here in forms available for practical use by means of Mr. Reagan's equally ready pencil. These details include the rustication of walls; chimneys; loggias, cortiles and cloisters, with their sculptured corbels or capitals or carved panels set into walls; windows and doors, including their surrounds, their carved, paneled or iron-studded shutters or doors, and the wrought metal

Farmhouses, Manor Houses, Minor Chateaux and Small Churches

From XI to XVI centuries in Normandy, Brittany and other parts of France
With a Preface by Ralph Adams Cram, F.A.I.A.

THE glories of old French architecture include far more than the Gothic cathedrals and the renaissance chateaux, for some of the most beautiful buildings in the world are the village churches and wayside chapels of France and the smaller domestic buildings of different kinds which abound in the rural districts and small towns. For the architect whose work includes country or suburban residence work no more helpful book could be imagined, for these old French buildings with their incomparable grouping, besides affording practical precedent for modern use, were developed in materials easily had today in almost any part of the United States.

New Edition, 8 x 11½ ins., 94 pages, almost entirely illustrations. Price $10

ROGERS AND MANSON COMPANY 383 Madison Avenue, New York

grilles which often protected them. Interior details include ceilings and roof timbers of differing degrees of richness; chimneypieces; more door and window details, and the innumerable other items which while apparently trivial mean so much in the carrying out of this most beautiful of styles.

Inclusion has also been made of some details of building which are generally overlooked, such as the measurements of floor brick and diagrams of their laying, or the dimensions of roofing tile and the manner of placing them, items perhaps devoid of much appeal, but valuable for their constructive interest.

THE PRACTICAL BOOK OF FURNISHING THE SMALL HOUSE AND APARTMENT. By Edward Stratton Holloway. 296 pp., 6 x 8½ ins. Price $6.50. J. B. Lippincott Co., Philadelphia.

THE popular standard of household decoration and furnishing, like the popular standard of domestic architecture, is probably higher today than ever before. Both standards have been raised by much the same means,—the work of trained architects and interior decorators who have so forcibly demonstrated the excellence of what should be used that to use it was obviously the thing to do; by the efforts of manufacturers of building materials and decorative adjuncts of all kinds to provide material which would aid in developing the modern home to what it should be; by travel and consequent familiarity with the best which Europe has to offer, and finally by a campaign persistently maintained year after year upon the part of publishers of books and magazines by which the public has first been educated away from older and lower standards and then led with growing knowledge to discriminate between what is good and what is better. The present volume is a recent addition to the works which aid in constantly improving this standard by training the judgment which regulates the result. Many people have natural good taste which goes far in keeping its possessors from making gross mistakes, but because such taste is merely good by nature and intuition and not strengthened by training it is likely to be timid and tentative, and hesitating to attempt what may be original and daring it fails to raise its work above a safely conservative level. While it is undoubtedly true that the most successful interior decorators are gifted with what might be called an instinct for decoration, there is much in the way of technical knowledge which must be acquired to fit even a genius for successful practice. This has been so systematized and reduced to formula that successful schools for interior decoration are now being carried on, and much the same principles as are being taught in the schools are elucidated in books, of which this volume is an excellent example. The chapter headings themselves indicate the scope of the contents, such as: Aids to Decision; Practical Use of Colors, Primary and Secondary; Harmonies of Likeness and Contrast; Form; Scale; Walls and Ceilings; Floors; Use of Furniture from Stocks; Actual Examples of Furnishing; Furniture Inexpensive and of Moderate Cost, all of which makes for excellent training for the student of decoration and which would be of great help to architects whose work includes at least the supervision of decorations and furnishings of the buildings which they design.

The work is replete with charts and with halftone illustrations which are so well chosen that one marvels at the inclusion of a number of full-page illustrations in color which, besides being of distressing ugliness, seem to plainly frustrate the teachings of the text. Possibly these illustrations were given as examples of what to avoid doing, or else to illustrate the value of certain color combinations. At any rate they are not sufficiently prominent to spoil the book, which is a valuable work on the subject.

"TOM TOWER," CHRIST CHURCH, OXFORD. Some letters of Sir Christopher Wren to John Fell, Bishop of Oxford. By W. Douglas Caröe, M.A. 127 pp., 9 x 11 ins. Price $8.35. Oxford University Press, New York.

THE wide interest in the work of Wren, the 200th anniversary of whose death has lately occurred, has been the means of bringing to light many relics of a more or less literary nature which have long been forgotten or ignored. In these days of change and upheaval it may seem strange that after more than two centuries it is still possible to bring forth letters and documents relating to a personage so renowned as Sir Christopher Wren; but the spirit of change moves but little in the quiet of Oxford colleges or in the seclusion of the auxiliary buildings of English cathedrals, and there are doubtless other documents of high historical importance which will one day be brought forth for some later anniversary.

These letters relate to Wren's immediate association with Christ Church College, and were discovered by Mr. Caröe when he was directing the work of repair upon Tom Tower and other parts of Christ Church. The excellent illustrations, chiefly of little-known examples of Wren's work, and several portraits, add considerably to the interest of the volume which constitutes an important addition to the literature which is growing upon the subject of Wren's life and activities.

FURNITURE AND DECORATION
of the ITALIAN RENAISSANCE
By FRIDA SCHOTTMULLER

THIS new book is a valuable source of reference to architects and designers on the domestic phase of the Italian renaissance. It contains 24 pages of informing text on the plan and decoration of the renaissance house and detailed consideration of the various articles of furniture. There are 590 illustrations of interiors, architectural details, various articles of furniture and accessories such as metal work and fabrics, all carefully arranged in groups and presented chronologically. Excellently printed in black ink on cream paper and bound in board covers with cloth back.

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THE PLANNING OF APARTMENT HOUSES, TENEMENTS AND COUNTRY HOMES. By Teunis J. Van der Bent. 355 pp., 9 x 12 ins. Price $4.75. Brentano's, New York.

THE large size of the field which the author covers in this work, practically a reprint of his volume entitled "The Hygiene of Man's Dwelling," is accounted for by the fact that the work is intended to meet the needs of pupils following his lectures on "Hygienic Principles in Planning of Dwellings, and Elementary Instruction in the Planning of Private Dwellings, Institutional Dwellings, and Hospitals." With the view of supplying an appropriate textbook for these classes there has been produced what is practically a treatise on the human dwelling place from prehistoric times when the habitation was a cavern under a rock, partially protected in front, to the present time, when the approved home is in a New York apartment house where a bath is provided for at least every two bedrooms.

Earlier periods and the planning of Greek, Roman and mediæval homes, interesting mainly from an archæological point of view, are passed over with treatment which is brief but adequate, and chief emphasis is laid upon the development of the modern home. Beginning with Part II the work possesses a high value for the class of students for whom it was written, or in fact for anyone interested in the economical planning of dwellings. It covers first the general subject of planning, which involves, of course, the securing of the utmost in the way of accommodations within the minimum of area or cubage, and there is covered also the planning of rooms in their relation to one another. All this includes the study of the best arrangements of such details as chimneys, stairways, baths and plumbing of different kinds and heating apparatus, prefaced in the discussion of city houses by matter covering the building of houses in groups or rows and by such details of planning as the securing of the best exposures, adequate light, and the best arrangement of the proportions of building plots which, according to different municipal laws, may be occupied by buildings. In his treatment of country and suburban houses Mr. Van der Bent covers the questions of grades, laying out of grounds and the provision in some instances of the necessary utilities. The section devoted to the treatment of modern tenement and apartment houses will be to many readers the most interesting and valuable portion of the work. From considerable personal experience in the planning of such structures the author writes of their most advantageous arrangement, particularly having in mind the securing from such a structure the utmost in the way of rentable space. This part of the work alone will render it of particular value to those concerned in any way with the planning, building or administration of tenement or apartment house property.

FOUNDATIONS, ABUTMENTS AND FOOTINGS. Compiled by a Staff of Specialists. Editors in Chief: George A. Hool and W. S. Kinne. 414 pp., 6 x 9 ins. Price $4. McGraw-Hill Book Co., Inc., New York.

SECURING suitable footings for modern buildings is a matter which engineers and architects often find baffling indeed. There are certain places, frequently in large cities, where areas which are now closely built up and thickly populated have been filled in and redeemed from what were originally marshes and swamps, and here, as in many other instances, the engineer must reckon with the certainty of encountering water or moisture not far below the surface to make difficult the obtaining of suitable foundations for the structure to be built. Engineers who have been engaged upon many of the tall buildings in New York, for example, know to their cost the countless subterranean streams which are still active beneath Fifth avenue and certain other densely crowded areas. Then there are other problems which arise where footings and foundations of important structures are involved with subways or other underground thoroughfares, and the solving of these and countless other problems more or less similar calls for engineering ability of the first magnitude.

In this volume, the result of collaboration of quite a number of well-known engineers of different kinds, there are reviewed, illustrated and studied the problems which are apt to arise in the vast majority of instances, and in some cases which will be encountered only rarely. The opening sections deal with "Soil Investigation" and "Excavations," each subject being subdivided under various minor headings. Later sections cover "Special Footings," "Underpinning," "Abutments" and other departments of the general subject, and one highly valuable section takes up "Legal Provisions Regarding Foundation Footings," in which a member of the Chicago bar discusses the extremely important legal aspects of such matters as supports, encroachments, the raising of levels, blasting, and other details concerning which it is necessary that the engineer or contractor be well informed and quite within his rights. The work would form a valuable addition to the working library of any architect or engineer, since it treats of all these important details with their latest developments in view.

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LISTS OF PLANT TYPES. By Stephen F. Hamblin, 163 pp., 7¼ x 10¼ ins. Price $5. Harvard University Press, Cambridge.

THE importance of landscape architecture has forced its profession into a position where it ranks as a well recognized department of architectural effort, while to train landscape architects there are now thorough and well systematized university courses which teach the fundamentals of landscape work. Along with this there have been gradually developed a considerable number of excellent works dealing with the study of the subject, for while the architect deals with form and materials, the landscape architect deals also with the same subjects, though his forms are different, and his materials are trees and shrubbery, or else the work involves the use of certain types of buildings such as pergolas, balustrades, terraces, pavilions or bridges. In addition to volumes dealing with actual design or the problems of engineering which landscape architecture presents, there are works dealing with other aspects of the subject. The present volume, for example, lists and classifies many of the materials with which the landscape architect builds. For certain uses there are specific plants which are particularly appropriate, and often there are many different types of the same species, some of which are more suitable than others. Then, too, the landscape architect must bear in mind the necessity of so ordering his work that at all times of the year it will present the greatest beauty of appearance which nature permits. All this naturally involves a close study of many different kinds of trees and shrubs,—their sizes, including height and circumference, habits, growth, seasons of leafage or flowering, and with plants of certain types it involves questions of annuals, perennials, and particularly of color and adaptability of the plants to use in various ways.

"Lists of Plant Types" is all that its name implies. In the most complete and yet the simplest manner possible, it lists all the trees and plants which the landscape architect working in any climate would be likely to require, together with such information as would aid him in selecting what would give the most satisfactory results under given conditions. It makes possible the planning of the grounds so that during the blooming season there is a long succession of color combinations in the garden, while during the winter the use of evergreen types will present the grounds in a pleasing aspect.

SIMPLE SCHEMES FOR DECORATION. By John Gloag. 152 pp., 6 x 8½ ins. Price $2.50. Frederick A. Stokes Co., New York.

SECURING an interior consistent as regards decoration and furnishing is work in which the architect, the interior decorator and the owner generally collaborate. Sometimes, of course, the decorator has no part in the work, and even when the result is worked out by the architect and the owner, the owner himself is generally responsible for the ultimate appearance. The architect's part of the work is to supply for the interior a consistent background for furnishings and decorations. This depends in large measure upon correct treatment of woodwork in the form of mantels, stairways, door and window trim, and in quite as great a degree upon wall paneling when it is used, whether the paneling be of wood or of the form often seen which makes use of wood mouldings fixed to plaster walls. The part the owner plays has generally to do with actual furnishing, and this important part of the work may be aided by some suggestions which will point out the most dangerous pitfalls and show the way to what will give the best results.

In this excellent little book there are given directions which will aid both architect and owner. The supposedly complex but really simple matter of wall paneling is well handled, and the reader will readily secure a correct idea of the paneling which belongs to each of the historic periods, profiles being given of the mouldings which are used on panels, dadoes, cornices, etc. The same is true of door and window trim, and particular attention is given to the correct designing of the fireplace and chimneypiece, which on account of their architectural importance deserve careful treatment, and the matter of window glazing, which involves the important consideration of spacing the window panes, is another detail which has been given helpful treatment. All this data which, of course, is of an architectural nature, is supplemented by chapters on decoration and furnishing, wall coverings, draperies and color combinations.

A HISTORY OF ART. By H. B. Cotterill. Down to the Age of Raphael. 442 pp., 6 x 9 ins. $10 net. Frederick A. Stokes Co.

ONE unmistakable indication of the steadily growing interest on the part of the American people in art in its various manifestations is found in the increasing number of works which deal with different aspects of art in a more or less popular way. These volumes have a powerful effect in first awakening public interest, then in training and stimulating popular taste and appreciation, and finally often in leading the student on from enjoyment and understanding of one form of art to appreciation of the many forms which art assumes. The very extent of the subject renders impossible its treatment in pocket manuals or works of small extent, but writers upon the subject find that by careful selection of their subject matter and condensation of its treatment it can be compassed within reasonable limits and not necessarily extended through an entire series of ponderous tomes, the size and cost of which would be discouraging.

Admirably calculated to foster this popular interest is this work of which the first volume has lately been issued. The author surveys the entire history of such related arts as architecture, sculpture and painting from the earliest period of which any records exist, and carries his examination through the various eras of development which the arts received in different countries. This volume divides the era which it covers into eight parts. Part I treats of Pre-Hellenic Art; II of Greek Art; III of Roman Art; IV of Early Christian Art; V of the Romanesque Era; VI of the Gothic Era; VII of the Trecento, and VIII of the Quattrocento. Each of these parts includes several chapters; for example, Part VI which discusses the Gothic period devotes a chapter to consideration of Northern Gothic Architecture and Spanish Architecture and Sculpture, another chapter to Northern Gothic Sculpture and Painting, and a third to Italian Gothic and the Tuscan Revival. In all these chapters the treatment involves considerable matter regarding specific buildings which stand as representative of their styles or the periods during which they were built. The work is thoroughly illustrated, and in connection with each of the periods covered there is included a list of works by which the reader is led to further study.

The ARCHITECTURAL FORUM

VOLUME XXXIX NUMBER 3

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ALBERT J. MacDONALD, Editor

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THE EDITOR'S FORUM

AN HONORARY DEGREE

AT the 67th annual commencement of Monmouth College the degree of Doctor of Laws was conferred upon D. Everett Waid, of New York, an alumnus of the college and the architect of the gymnasium and other buildings upon the college campus.

ALABAMA MARBLE CO. COMPETITION

DETAILS were given upon this page several months ago regarding the traveling scholarship instituted by the Alabama Marble Company for the study of the use of marble in modern buildings. The problem for the first of these competitions was the design of a small bank, and at a meeting of the jury of award this disposition of honors was made: The first prize, which carried with it the traveling scholarship, to Frank Martinelli, of New York; second prize to Phillip Sanfilippo, of Brooklyn; third place to George N. Pauley, of Pittsburgh; fourth place to F. Ray Leimkuehler, of St. Louis, and fifth place to Victor Pribil, of Woodhaven, N. Y. Twenty-three drawings were submitted, and they were on exhibition at the Beaux Arts Institute rooms from August 29 to September 1.

Walter D. Blair is the architectural adviser of the Alabama Marble Company, and the jury of awards includes Donn Barber and John V. Van Pelt, of New York; Abram Garfield, of Cleveland, and R. Clipston Sturgis, of Boston.

STANDARDIZED SPECIFICATIONS

AS the benefits of standardization in specifications become increasingly apparent such standardization is extended to the use of various kinds of building material, and recently the principal manufacturers of expanded metal lath have agreed upon and issued specifications which apply to the use of their materials.

For many years the different manufacturers of metal lath have been issuing slightly different recommendations for the use of their materials. Since they are manufacturing and marketing almost 75 different kinds, gauges, weights and qualities of lath, it has been extremely difficult to arrive at specifications which would be suitable for use with all these varieties. These new specifications, however, have reduced this large number to but ten different classifications, therefore greatly simplifying the sale, distribution and use of such lath.

The specifications, which may be had of any of the larger metal lath manufacturers, are issued in booklet form, accompanied by illustrations and drawings to make the specifications plain. The specifications are issued with the approval of the Associated Metal Lath Manufacturers and the American Specification Institute.

Standard specifications have also been adopted and issued by the American Institute of Steel Construction, covering the design, fabrication and erection of structural steel. This new standard replaces a variety of individual specifications hitherto put out by individual manufacturers, and makes for simplicity and uniformity in the use of steel.

SUGGESTIONS FOR FILING

THE value of much of the advertising matter which the manufacturers of building material issue to architects and engineers is minimized or lost unless such matter be so filed that it is instantly available when it is needed. The great diversity in the filing systems in use by different architects has led to the studying of the subject by a committee of the American Institute of Architects, the result being a brochure describing the Standard Construction Classification recommended by the Institute.

In many offices when advertising matter of this nature is filed at all it is arranged alphabetically under the names of the manufacturers. This plan, of course, makes it quite necessary that the individual consulting the file be familiar with the names of the concerns manufacturing the commodity in question. One interested in plate-glass, for example, must be informed of the names of the manufacturers of such glass or the most complete file possible will be of little service. According to the Institute's plan, however, the many subjects in which an architect is likely to be interested, from the first detail of preparing a building site to the final detail of equipment, are so divided, sub-divided and cross-referenced that a circular, catalog or other detail giving information if worth filing at all is so filed that it is quickly had when wanted. This excellent system of filing is also recommended to the attention of the manufacturers whose advertising forms much of the matter filed, for their co-operation will aid materially in making the use of the system effective, thus giving their advertising matter a far greater and more permanent value.

The broad purpose back of the A.I.A. Standard Classification is to simplify filing in an architect's office where an adequate file can be operated by a person without technical knowledge, and where the maintenance of such a file is within the reach of all.

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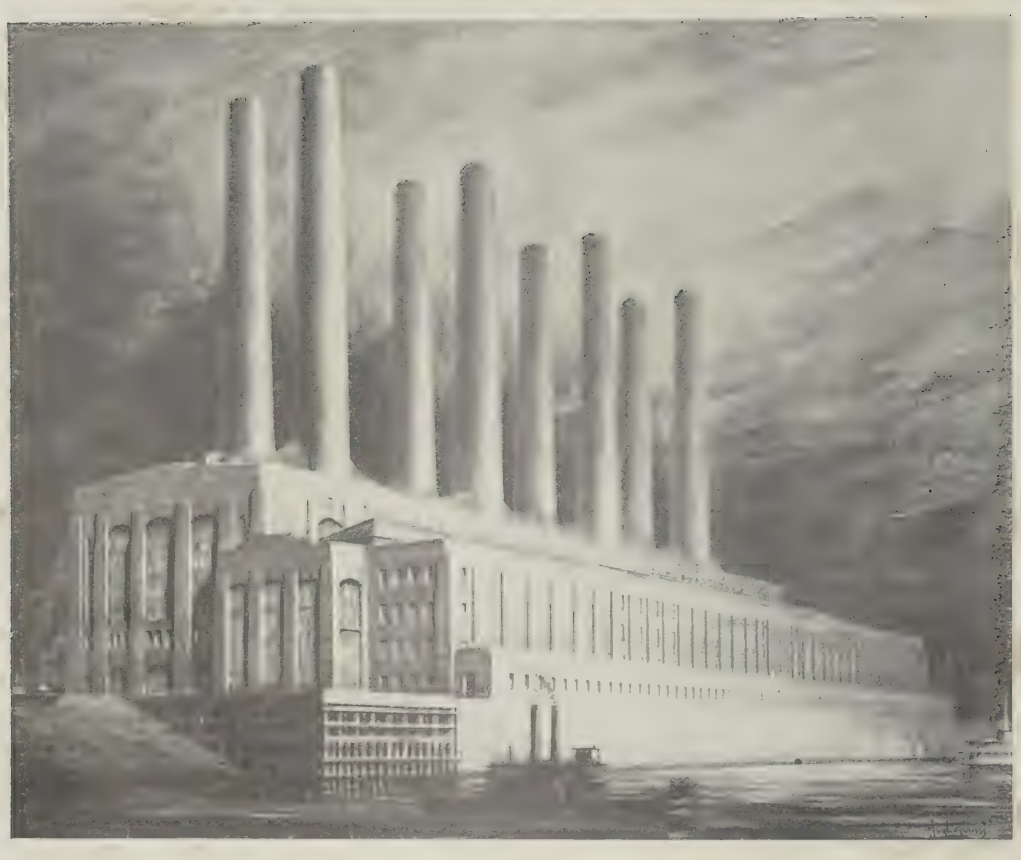

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From Crayon Drawing by Hugh Ferriss

The
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Industrial Architecture in Concrete

By CASS GILBERT

IT may be taken as an axiom in concrete construction that the simpler the form the better the design. The nature of the material dictates the form of all its parts, and assuming that the purpose of the structure is kept in mind, as it should be, this purpose is necessarily expressed in very simple terms.

I recall that Russell Sturgis once said to me about terra cotta that it should be used as a "plastic" material, that "it should be *poured* at the top of the building and allowed to run down until it covered the structure," and my answer was, "it won't 'pour' and it won't run down; it is plastic only until it is burned; it has to be designed with that in view." Concrete is not a plastic material. It is no more plastic than cast iron, and less so than terra cotta. Generalizations are well enough for purposes of conversation, and serve to accent a witty remark, but they are not a sure guide to the art of design in any of its myriad forms.

Granite in its formative stages was a liquid material, but no one will contend that it is so now, and whatever concrete may be in its initial stages, it certainly is not plastic when it becomes concrete. Concrete must therefore be treated in accordance with its own nature, and so treated it is a highly useful building material, with many yet undeveloped possibilities in design.

Many of the Roman domes and vaults of vast dimensions were of concrete of a sort, and a pretty good sort at that, and surely few nobler, grander structures have been erected by man than these. Concrete in architecture depends upon the "form" upon which, or into which, in its semi-liquid state it is poured. The Romans and Byzantines used brick and tile as well as lumber in constructing these

Crayon Drawing by Hugh Ferriss

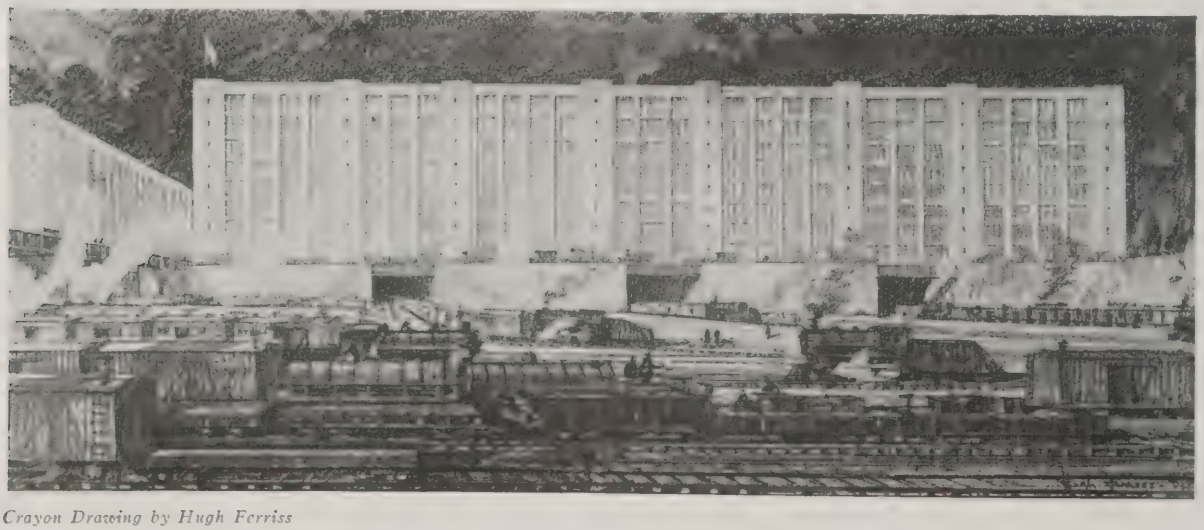
Study for Buildings of United States Army Supply Base, Brooklyn
Cass Gilbert, Architect

Detail of Concrete Viaduct, United States Army Supply Base, Brooklyn

"forms," hence curved surfaces such as domes and vaulting were of the very nature of their structural design. We use lumber, or occasionally sheet metal, for the "forms," and we have developed our concrete design accordingly. The ancients probably built empirically; we now, with greater knowledge of the strength of material, build scientifically. As we build with a primary view to low cost (a matter which concerned the ancients very little, as they had slave labor for their larger enterprises), we are forced to consider economy at every stage. Hence, as it is cheaper to build a lintel and a post than it is to build an arch and a pier, in proportion as it is cheaper to build in a straight line than in a curve, we follow the direction in which the finger of "economy" points and build columns and girders and flat surfaces rather than those in complex curves. It is cheaper because the "form" costs less. Therefore the "form" dominates the design, and economy has its innings. Still, is not this the problem that has had to be solved age after age as long as man has erected buildings, even though his work may have been done by slaves, a condition, by the way, which certainly does not exist today? The greater the difficulty, the greater the honor in surmounting it. If concrete, after full trial, proves to be the economical material for use, it will in time be well designed. One thing we may be sure of, and that is that for the present at least the evidence before us points toward simplicity as the basic principle of design in concrete, and that is a lesson much needed in this complex, restless age. Why not make simplicity, then, the keynote, and welcome it as a help and not an obstacle to good design? Why attempt to adorn this simplicity with trinkets and gewgaws and patterns and raw bits of colored tiles or panels of brick, or fictitious corbels, cornices, capitals or other details culled from traditional architecture constructed of other materials? In short, the logic forbids such intrusions.

There are great possibilities of texture in concrete, as yet untried, and texture is needed to dispel a barrenness of effect in broad surfaces. In stone masonry or in brickwork the joints alone would give a certain quality of "texture" in the surface of a wall, but while there are no joints in concrete (except those widely spaced for expansion) there is no reason why the texture of the surface may not be made beautiful. It is not necessary to smear it with calcimine, as is so often done. I have seen a concrete bridge where the aggregate was of a trap rock or granite that gave a rich, warm color and a beautiful texture to the surface that could scarcely be rivaled by any other material.

There is something very fine about a great gray



Crayon Drawing by Hugh Ferriss

Study for Railroad Side, United States Army Supply Base, Brooklyn
Cass Gilbert, Architect

Crayon Drawing by Hugh Ferriss

Study for United States Army Supply Base, Brooklyn
Cass Gilbert, Architect

mass of building, all one color, all one tone, yet modified by the sunlight or shadow to pearly gray of wonderful delicacy. It is the big simplicity of the thing that counts, and if there may be projections for necessary fire towers or elevator shafts, or other salients, if there may be low roof structures for tank houses or machinery, and if the glass surfaces are kept in scale, there may be silhouette, and light and shade and shadow and reflected light that will make a picture not easily to be forgotten. Such effects may occasionally be seen in concrete industrial buildings. It was this sort of thing I sought to achieve in the Army Supply Base in Brooklyn, and these are among the considerations that dictated its design. If it has in any respect been successful as a work of architecture (aside from its practical efficiency), it is because of its manifest simplicity.

I have emphasized the importance of simplicity of outline and surface, and have decried the use of extraneous ornament, especially in industrial buildings, as out of character with the direct and practical purpose of such structures. There is no reason why concrete buildings for other purposes, with very simple outlines and broad surfaces, may not be richly adorned with color and inlays of mosaic

Detail of United States Army Supply Base, Showing Concrete Treatment
Cass Gilbert, Architect

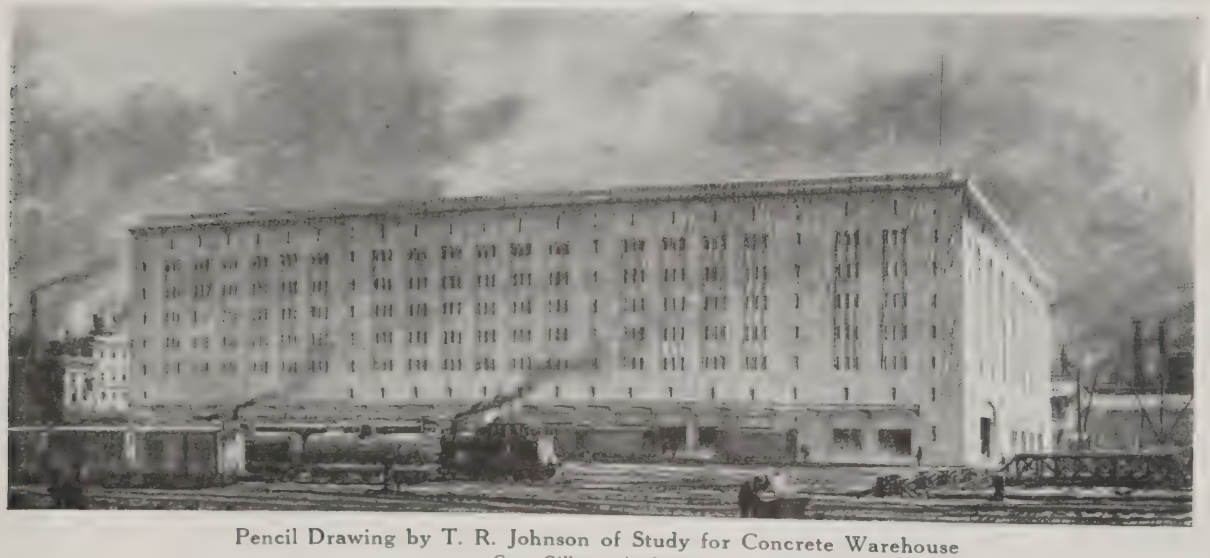
arabesques in bands or panels, and the reveals of the windows and the marginal lines of walls and openings all enriched in this manner. If the fundamental lines are simple and the surfaces such as are reasonable in concrete, the decoration may be as rich as you please, but if you are wise you will use such liberty with great restraint.

Concrete invites study. It is as individual as steel or stone or brick or wood, and while at first (as in the early development of all building material) forms consistent with other materials are commonly used, new forms adapted to the new material will be found, and a new architecture may result. Thus was the transition from the Attic shepherd's hut made to the Parthenon, until forms originally of wood came to be the classic contours of the age of Pericles. I anticipate no such triumphant result, for we are not the ancient Greeks, nor yet is concrete Pentelic marble.

"I hold no brief," as the phrase is, for concrete as against other useful materials. In other words, I do not prefer it above others, except in certain specific cases where the nature of the structure or economic reasons imply its use. It is not always the most economical material, though it frequently is so, and as a structural material it requires very expert handling. Bad concrete is not only worthless; it is dangerous, and concrete buildings should not be attempted by incompetent or negligent builders. I remember my old friend George B. Post's making a brief speech on the subject of reinforced concrete some years ago in London, in which he summarized the whole matter by saying: "Concrete is, as Sam Weller said of veal pies, 'weal pies is werry good things when you knows the lady as made 'em.'"

The temptation to reduce the thickness of walls and floors, particularly the former, and to make concrete construction as light as possible, is very great, and it should be resisted, just as one should resist the temptation to get the last ounce of theoretical strength out of a brick wall or pier. There should be something more than a "factor of safety." A building owes something to its neighbors as well as to itself, and it should not only be strong, but it should *look* strong. A very small percentage of increase in the cost will accomplish this. Any sensible architect, and most business men, would prefer to spend money on excess strength and the appearance of solidity to spending it on elaboration of ornament. There is no reason why our industrial buildings should be ugly. It is not necessary for a building to be ugly in order to be useful. That's why skillful architects should design these buildings. They are too often left to draftsmen in contractors' or engineers' offices who have not been trained in the art of design or whose only function is to lay out the work that will be cheapest for their employers to build—cheapest for their employers, but not cheapest or best for the owner of the building. In the fact that it is difficult to design an industrial building and make it look well, lies the very reason why a highly expert architect should be retained, and most of the best concrete construction contractors know this and prefer to work under, or with, such an architect.

When the architect, the engineer, the contractor and owner all unite in a joint effort, travel along the same road to the same destination, good design and good building are almost a foregone conclusion. This is so in all building work, but especially so in concrete, where the builder can show from his experience and special knowledge of the material, economic methods of using it, where the architect can guide the design (of which subject he is supposedly a master), and where the engineer can work out scientifically the structural problems encountered. But of all things, it is necessary to have a good "owner," for without a good client no good building can be built. Let us give chief praise to the owner, then, when a good building is built, and praise be, there are many such in this country.



Pencil Drawing by T. R. Johnson of Study for Concrete Warehouse
Cass Gilbert, Architect

The Choice of an Industrial Building Site

By MAURICE M. OSBORNE, M. E.

THE first step in the detailed planning and construction of an industrial building is the choice of its site. It is frequently argued that this is a matter lying between the owner and his real estate agents, and that there is no need for the services of the architect and the engineer in the transaction. In many cases, probably the majority, the choice of the architect for an industrial building project is deferred until the land has been selected and bought.

This undesirable state of affairs has been mainly brought about through the owner's lack of understanding of the architect's and engineer's full value, and conversely by the architect's and engineer's belief that this problem is a little beyond their province.

It is nevertheless true that the engagement of the services of the architect before the selection of the site should operate in every way to the advantage of the owner, and every architect will admit that the earlier he may be brought into a building problem as principal adviser the more valuable his services will be to his client.

Further, when it is known that a building project is under consideration, an early selection of the architect certainly shortens the misery of all of the aspirants for the commission, and wasting less of the time of the less fortunate many, conserves the nervous energy of the chosen individual or firm for the task to be accomplished.

It is proposed in this article to outline the various ways in which the architect and the engineer may be of service to the owner in the choice of his building site. Even though the owner may be equipped to make the necessary study and selection on his own behalf, a knowledge of these matters should be of value to the architect, both in relation to the problem later to be worked out, and as a means of keeping his present or future client interested in him through judicious conversations and discussions.

The selection of an industrial site is necessary when a new industry or business requires quarters for the first time, or an established business, through growth, obsolescence of plant, change of type of neighborhood, or expiration of lease, must shift to an economically sounder location.

Manufacturing plants present the most complex problem in location of industrial buildings and will be considered mainly in this discussion. Considerations governing location of warehouses, garages and other industrial and semi-industrial types, are included under the general principles applying to manufacturing plants.

It is not as yet usual for the architect or engineer to be entrusted with the study of the general location of a new plant serving a nation-wide business, but the principles followed should nevertheless be understood.

Industries have always shown a tendency to localization in centers producing a typical line of products. For example, the state of Connecticut has for many years been a great metal-working center, especially in brass products; the steel industry is concentrated in a corner of Pennsylvania.

This localization is the result of a number of influences, which must be understood before any intelligent general selection of plant location can be made. However, as a general rule, an industry would best be established where similar industries already have flourished.

As offsetting this is the tendency of certain industries to change their established centers, through change in centers of population, types of labor supply, or sales territory.

In the United States census of 1900 seven advantages were listed, which in varying combinations, tend to cause localization of industry.

These are:

1. Nearness to materials.
2. Nearness to markets.
3. Water power.
4. Favorable climate.
5. Supply of suitable labor.
6. Capital available for investment.
7. The momentum of an early start.

The more bulky and the cheaper the raw materials used in the projected plant, the nearer should the plant be to the source of such materials. As their bulk decreases and value increases, the further is it economically permissible to ship them for manufacture, all other considerations being equal.

The more centrally located a manufacturing plant may be with respect to the centers to which it must ship its product, the lower its shipping cost per unit and the more advantageous its situation. A study of markets, freight rates, railway lines, etc., is necessary before arriving at any conclusions on this point.

An industry requiring water power, or a large supply of pure or cold water, must be further influenced by that consideration. The advent of hydro-electric and steam power has made water power less of an influence than formerly in establishing the plant site.

Climate plays a part in textile and certain other industries, but less now than formerly.

In very large industries requiring much unskilled labor, labor will come to the location selected for other reasons than that of labor supply. As the industry requires more and more skilled and intelli-

gent labor, the more it must seek localities where the required type of skill has been developed through training and heredity. Skilled labor is settled, it has a high standard of living, friends, social and family ties and traditions, and dislikes to migrate.

As to capital, a town or city looking for industries, ready to supply tax-free land for a period, with a Chamber of Commerce working to serve in every way to establish the new plant, and capital ready to be invested in it, naturally offers substantial attractions to the owner seeking a new site.

One of the best examples of the effect of the momentum of an early start is in the establishment of the textile industry in New Bedford, Mass., to supplant its former industry of whaling. When the heyday of the whaling industry had passed with the discovery of petroleum in Pennsylvania, the capitalists of New Bedford decided to manufacture textiles. All they had to their advantage were climate, capital, and an early start. They had no water power, were hundreds of miles from the source of raw materials, and not at all centrally situated as to markets. Yet New Bedford is today one of the great textile cities of the country.

Let us say that the owner and his engineer or architect have made a study of these considerations, and selected a general locality for the new plant.

The next step is a detailed examination of the locality for an actual lot of land.

Here the following major considerations govern in greater or less degree:

1. Transportation facilities:—by rail, water, and for labor to and from work.
2. Initial building requirements as to space, adaptability of space to buildings of minimum cost to fit the purpose, and as to future expansion.
3. Local labor supply and housing facilities.
4. Dependence on other industries.
5. Aid from the community, and water, gas, electric and other services.
6. Building restrictions and zoning laws.
7. Local markets.
8. Advertising value of site.
9. Cost of the land.

The architect and engineer, if commissioned early in the attack on the problem, should begin at once with the owner a study of the requirements of the business to be housed. From this study should proceed an ideal plan of the plant to be built. Any final plan will probably be a compromise between the ideal and that made necessary by actual conditions, but having the ideal plan at hand will aid greatly in the selection of a specific lot of land.

Once the requirements under the major considerations listed here have been determined, the real estate agent is brought into action. He submits various lots of land to the owner, which in his judgment most nearly meet the requirements. The architect and engineer may then examine these lots with the owner, as to the considerations numbered here, in particular:

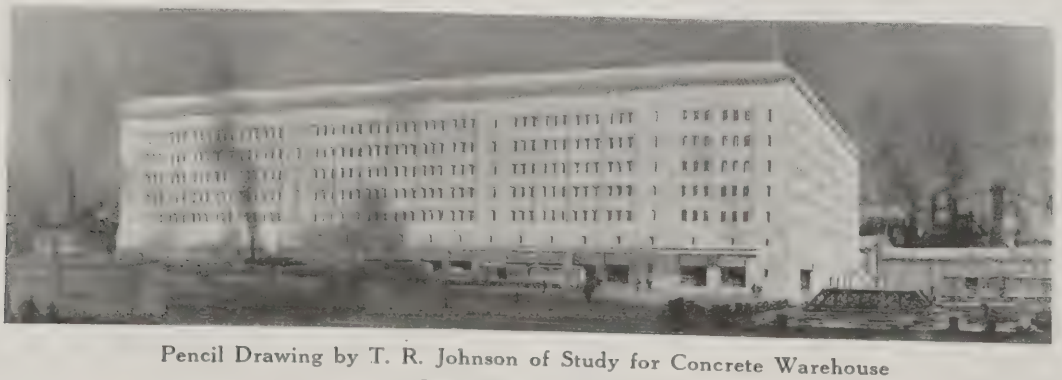
1. Transportation facilities.
2. Building requirements, future expansion and foundation conditions, which later greatly affect building costs, and which may be the worst on the cheapest land.
3. Water, gas, electric and other services.
4. Building restrictions and zoning laws.

Such examination will save much time and money for the owner, at very little greater expense for services than if the architect and engineer had been selected after deeds had been signed and titles recorded.

It is therefore clear that the architect and engineer may do much in connection with the selection of industrial building sites, and that their services should be valuable in that connection.

There is a further value to the architect and engineer in taking part in the solution of this problem. This is because of the contacts brought about with real estate agents, which frequently lead to information about other prospective commissions and to legitimate new business. Real estate agents and architects should have close relations for mutual prosperity.

Finally, let it be said that the discussion here applies primarily to that type of job so rare and dear to the heart of the industrial architect, in which the owner finds and furnishes all the cash himself. Advice as to the best action to be followed when the owner tries to get someone else to build for him would undoubtedly be superfluous, would take a book instead of a brief article to set forth, and would probably be wrong.



Pencil Drawing by T. R. Johnson of Study for Concrete Warehouse
Cass Gilbert, Architect

General Principles of Industrial Building Planning

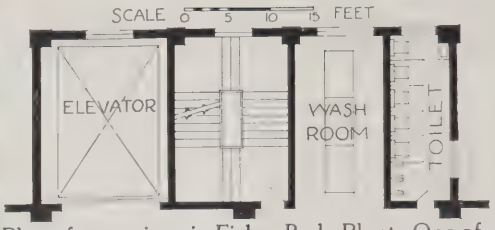
BASED ON INTERVIEWS WITH INDUSTRIAL ARCHITECTS

THE huge development of manufacturing in this country has produced industrial buildings of great magnitude, in the building of which the heads of large industries have in the majority of cases called upon all available sources of aid except that of architecture. There have, however, been a sufficient number of industrial plants erected from the designs of architects to point out the possibilities of improvement over the ordinary means of enclosing a given volume of space, not only from an æsthetic standpoint, but also from the economic viewpoint of the owner. From the purely architectural angle, the interest of the architect would seem to be in the treatment of the exterior of the building, but for two reasons his interest must and does exceed this scope. In the first place, plan is of equal or greater importance than exterior design, and while the elements of plan in an industrial project are simple, it is from their disposition that the architect receives the key to exterior design; secondly, the value of architectural planning is just as positive in industrial work as in the most complicated monumental structure. The natural faculties for securing logical and convenient arrangement of parts possessed by the architect guarantee to the owner a study of his requirements and a co-ordinated grouping of functions within the building that have a business value far in excess of the architectural fee incurred.

A statement recently made by J. P. H. Perry, Vice-president of the Turner Construction Company, which has had extensive experience in industrial building, bears out this contention. He said: "There is not much doubt but that the very finest industrial buildings which have been built in the last ten years in this country, the finest in general effectiveness as well as in appearance, have been produced under the direction of architects. A certain distinctive appearance, a certain completeness of design, a more perfect interior arrangement and a general suitability seem more likely to prevail when the bigger industrial buildings are handled through an architect's office than when an architect is not in the picture."

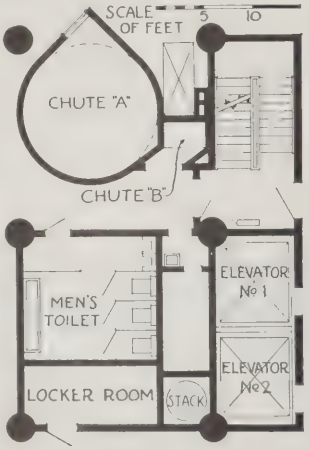
Interior of Power House, Victor Talking Machine Co., Camden, N. J.
Crane extends across width of building with monitor above. The monitor roof drains to the center to assist conducting warm air and gases out through the ventilating sash
The Ballinger Company, Architects and Engineers

Rear View of Mill Building of Kahn & Feldman, Brooklyn, showing extensions at ends and center for toilets, stairs and elevators
Buchman & Kahn, Architects



Plan of extensions in Fisher Body Plant. One of these provided for every 18,000 square feet

It is therefore of definite interest to architects who would seek commissions in the industrial field to review the major principles of factory planning, based on data furnished by architects and engineers who have made a special study of this particular architectural problem. Modern manufacturing has been so intensified and speeded up because of keen business competition on the one hand and the shortening of working hours and higher rates of pay on the other, that no concern with an obsolete or poorly planned building can hope to carry on business successfully; the building must work to produce efficiency in as great a degree as the management personnel. Its plan has a direct relation to output.



Plan of Interior Toilet Group Western Electric Co. Warehouse, New York

The first requisite to good planning is a knowledge of the operations of the industry to be housed. Time spent in preliminary investigation of this character cannot be overvalued. In the instance of the Bunte Brothers' candy factory in Chicago, illustrated in this issue, two representatives from the architect's organization, one an architect and the other a mechanical engineer, spent two months in continuous study of plant operations and the movement of material. The engineer familiarized himself with the size, load and mechanical requirements of every machine used in the plant. This and other detailed data were collected, and formed the basis for the study of the general scheme of building arrangement which further permitted the definite location of every machine required in the new plant.

Detailed study of intricate manufacturing methods is not always necessary or possible; the success of a plan, however, demands a clear knowledge of the essential process and methods of handling material so that the most direct lines of travel may be determined in the first stage of planning. Many manufacturers are inclined to believe that they alone know enough about their businesses to design a plant because they alone understand their many secret formulæ; these are of little or no interest to the architect or engineer who knows that all manufacturing is a series of operations by various machines and appliances. The architect, however, should always co-operate with the owner or his managing expert who will, as a rule, select machinery and work out sequence of operations.

The first detail in developing an industrial building plan is the preparation of the site plan showing railroads, wharves (if any) and streets located and grades indicated; all underground water, electric and sewage lines should likewise be indicated. This, together with calculations of the quantities of raw materials used and the product turned out, is used to determine sizes and locations of buildings, locations and lengths of tracks, capacities of storage bins, yards or buildings, and warehouses and shipping buildings for the finished product. The location of these with respect to their uses and handling requires careful study to avoid unnecessary travel. Every industry has this problem, though perhaps none to a greater degree than large machine works, where for every ton of finished product at least three tons of raw material has to be handled.

Storage of coal and its delivery to the plant are matters of importance. The power plant can be located at the most convenient point for handling fuel and ashes, because transmission and underground pipe lines will carry light, heat and power to any desired point. By all means proper equipment for handling of coal and ashes as outlined in a later article should be incorporated. If an overhead bunker is not a part of the original contract it is well to make provisions for a future installation. Boiler and engine room likewise should be arranged for future extension. The expense of correcting oversights of this nature at a later time is tremendous, frequently involving entire rebuilding.

The types of buildings suitable for manufactur-

ing purposes may be divided into three general classes: (1) the one-story, three-bay construction for foundries, forge and machine shops for medium and heavy work, requiring overhead cranes; (2) the one-story sawtooth or monitor lighted building for lighter work requiring no heavy cranes, which may be of any width and any number of bays, and (3) the multi-story building for all types of manufacturing purposes as well as storage except of the heaviest character.

The first type has generally a wide center bay served by one or more heavy traveling cranes and ranging in height from 30 to 60 feet to the roof with a narrower bay at each side for the lighter machine tools, etc. Foundries are similarly arranged with heavy moulding in the center bay, with melting furnaces, core shops and core ovens in one side bay and machine moulding, sand blasting, etc., in the other side bay. With the monitor form of roof the headroom may be less than in other types of wide building, because piping, ducts, etc., may be accommodated in the monitor, thereby reducing volume and cost. Shops using cranes, of course, require the high bay, and the side bays are frequently two stories high with a cantilevered balcony to serve as a receiving platform for the crane. The second type, usually with sawtooth roof, may be of any width, with columns spaced to suit the requirements of the industry. For spanning wide areas the sawtooth roof gives the best solution to the problem of lighting, and with recent developments in the design of trusses the possible objection to the rather numerous columns required in standard sawtooth construction is removed. The third type covers a great variety of buildings, including loft buildings and industrial terminals erected for several tenant manufacturers in which hundreds of employes are frequently accommodated. The major problem here, aside from arrangements dictated by manufacturing requirements, is the provision of adequate safe exits and ample elevator facilities for the handling of material and passengers. With the general adoption of the individual motor drive for machinery, the problem of power transmission has been greatly simplified and the old belt tower eliminated.

The width of multi-story buildings is determined by lighting conditions and manufacturing requirements. Shoe factories, as a rule, are rather narrow compared with other factories, usually about 45 feet with 50 feet as the maximum. Textile mills vary from 75 to 125 feet for all departments except weaving, which requires excellent light and for which the sawtooth weave shed is usually preferred.

The floor arrangement of tenant loft buildings is generally determined by economical column spacing; partitions are usually light and movable and can be placed to meet requirements of individual tenants. The standard and most economical bay is 16 by 25 feet; larger spacing necessitates more

Combined Shipping Court and Garage, Hydrox Co. Ice Cream Factory, Chicago
Electric trucks are used exclusively and connections for charging are provided overhead
Richard E. Schmidt, Garden & Martin, Architects

Interior Court of American Chicle Co. Plant, Long Island City, N. Y.
Provides center light in building 200 feet wide and space for 16 freight cars
Car scale at right under track. Court 40 feet wide

expensive construction, and except for special manufacturing reasons is not often warranted.

Natural lighting is of great importance. In general it may be said that all wall area not required for support should be glazed. In particular, if the light from the sky is unobstructed, 50 per cent of the wall should be glass and may well be as much as 80 per cent. If light is cut off by adjoining buildings, the glass area should be enlarged proportionately and may need to be the maximum. Consideration should also be given to possible future obstruction of light, and provisions made for contingencies.

In the multi-story building, if the width of the floor is greater than 40 or 50 feet, all available space should be glass. Greater widths than this are inconvenient because of fire hazard and difficulty in heating and ventilating. In buildings with windows on opposite sides and with the usual 12- to 14-foot ceiling heights, 60 feet is satisfactory for the floor width and permits good machine layouts. Greater width of course is possible, but the center of the floor would have to be used for storage or other purposes requiring little light. The windows in these wide buildings should reach from the ceiling to within 3 feet of the floor. In the Bridge & Beach Mfg. Co. plant, illustrated in this issue, the sash are carried to within 2 inches of the undersides of the concrete slabs, the spandrel beams being placed above the slabs to accomplish the result. This method prevents shadows on the ceilings and allows them to reflect light to the floors.

In flat slab buildings the outer bays may be extended in cantilever fashion 4 feet beyond the outside of the outer columns, permitting continuous sash and also continuous work benches. It is a universal experience that facing the source of light is fatiguing; work benches should therefore be arranged so that light will fall on them from the side rather than from front or back; a still better plan is to place them at an angle to the windows to permit momentary glances out the windows to relieve eye strain with the least effort and interruption to work.

Planning the layout of floors requires knowledge of manufacturing processes, and here the value of preliminary investigation is proved. From this data the machine positions are plotted and the lines of travel established, care being exercised to avoid conflict of travel in opposite directions; the means of transportation must be known and ample space provided for the easy passage of trucks in opposite directions when required. Otherwise, heated arguments between employes will cause confusion and loss of time. Planning for future extension should always be kept in mind. Any industrial plant should be arranged to permit extensions with the least possible expense and interruption to business. In fact, the ideal plant is designed at the start to cover the largest possible future growth, and at first only the needed number of units built. Modern handling of materials is designed to eliminate hand labor as much as possible. Conveyers should be installed wherever they will displace enough hand labor to pay for the investment. In a large brass foundry, for instance, a conveyer carries the metal from the basement to the charging floor; the moulten metal is conveyed by traveling cranes to the moulds. A conveyer belt under a grating in the floor returns all used moulding sand to the sand basement where it is mixed with new sand after screening and brought up by another elevator and conveyer and distributed to the moulding floor. Much of this work was previously done by trucks and wheelbarrows. In warehouses and tenant loft buildings, as in the case of the Gilbert Building, New York, a continuous spiral chute is installed to permit the easy handling of packages and small shipments from each floor to the shipping platform.

Many of the factors which improve factory buildings architecturally are dictated by legal regulations now generally in force for the safety and protection

of employes. Yet these have not been standardized, and architects should familiarize themselves with emergency conditions that have arisen in factories and make provisions for meeting them. Ample and safe exits are foremost in importance; in a wooden floored building of any considerable height there should be not only fire escapes but ample fireproof stairways enclosed in fireproof walls.

Center Light Court, Spinning Mill, Goodall Worsted Co., Sanford, Maine
Lockwood, Greene & Co., Engineers

The convenience of the workers should be a goal to strive for in planning; unnecessary traveling or the climbing of stairs to reach related departments of the work or the toilets and washrooms is annoying to the workmen and a direct cause of lowered efficiency. Stairs, elevators and toilets should be placed conveniently for all parts of the building, to interfere as little as possible with the lighting and to give the least possible obstruction to floor space. In buildings with party walls, the obvious and generally adopted plan is to locate them along such walls; in long, narrow buildings they are frequently incorporated in extensions at the ends or in the centers of the long sides. Exits should include at least one enclosed fireproof stairway, either exterior or interior, and from every floor there should be

Group of four standardized warehouses with shipping facilities and railroad sidings in basement. Flat slab reinforced concrete construction. Central Manufacturing District, Chicago
S. Scott Joy, Architect

not less than two exits with no point of the floor more distant than 100 feet from an exit, and in sprinklered buildings 150 feet. The second exit should preferably be another stairway.

In determining sizes of stairways, it is recommended that the aggregate width of stairs in each story of a fireproof building shall be sufficient to accommodate at one time one person for each 150 square feet of floor area of the story served. The minimum unobstructed width of stairways and passages leading to them should be 44 inches.

All elevator and other shafts leading from one floor to another should be enclosed with fireproof material and have fireproof roofs and all openings provided with fire doors. Elevators in multi-story buildings are determined in size and number by the bulk of materials to be handled and the number of employes to be transported. The passenger elevators may be determined by rules similar to those applying to office buildings; in the large tenant manufacturing buildings in the Central Manufacturing District, Chicago, freight elevators are provided in the ratio of one to every 30,000 square feet of floor space. Similarly, trackage for one freight car is supplied for every 20,000 square feet of floor space.

In congested city districts it is good practice to limit undivided floor areas to 20,000 square feet when of fireproof construction and not sprinklered; with sprinklers the area may be increased to 50,000, and in buildings of one story these figures may be increased 50 per cent.

Certain standardization is possible in industrial buildings, and where large scaled operations are planned it is of definite value in speeding up construction; it likewise has an influence tending toward simplicity in plan. In the buildings of the Central Manufacturing District, Chicago, of which S. Scott Joy is the architect, two types of construction only are used, one mill construction, when small bays suffice, and reinforced concrete when larger bays are required. The mill construction bays are 16 x 16 for laminated flooring in buildings having long continuous runs of floor, thereby eliminating all cutting possible. Joists and heavy matched and dressed flooring are used when greater spans and lighter loads are required. Girders always run the short dimension of the building to permit the framing of the floor before the walls are brought up.

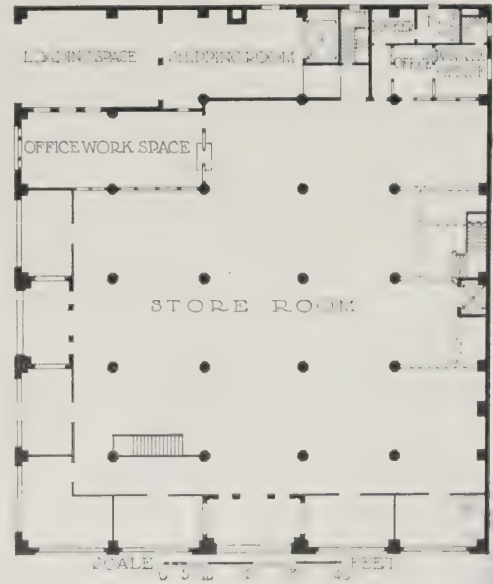
The flat slab bay 20 x 20 is the standard for reinforced concrete buildings. When larger bays than this are required, the live loads are decreased and the dimension of the bays increased in the direction which allows the most practical and economical use of lumber in mill buildings, and in concrete buildings the exterior bays are increased by a cantilever slab extending 4 feet beyond the outside columns.

Interior of Shipping Building of Joseph Campbell Co., Camden, N. J.
Typical steel framing for flat roof with small monitors. Note conveyer system and spiral chute to shipping floor
The Ballinger Company, Architects and Engineers

General Exterior View

Interior of Second Floor

THIS building is used for furniture showrooms. Reinforced concrete with flat slab floors; floor loads, 150 pounds. Exterior faced with rough texture brick with cut stone trim and terra cotta cornice. Metal and plate glass show windows; other windows wood frame except those on exposures, which are fireproof. Low pressure gravity steam heat. Date of contract, January 24, 1922; total cost, $180,203; 14 cents per cubic foot.



First Floor Plan

CLEMONS BROTHERS BUILDING, CHATTANOOGA, TENN.
LOUIS H. BULL, ARCHITECT

Co-operation Between Architect and Builder

By HAROLD FIELD KELLOGG, *Architect*

ONE always feels that the art of the middle ages as expressed in architecture is the result, largely, of the guild system. How that differed from our trade unionism of today is not the argument here; that the work was done by close co-operation between the designer and the man, the guild or the union which actually executed the design, is a matter of history. Can this co-operation be renewed? If it can, our trade unions will have taken their place in the community by doing their share to express the civilization of our times. If the architect had to execute some of his designs, it is probable that they would be far different. To design a building which can be built with unskilled labor properly directed is an interesting problem.

Such an effort at co-operation has been attempted in the design and execution of the A. M. Creighton shoe factory, in Lynn, Massachusetts. Unlike some clients, the owner knew what he wanted and was willing to pay a fair price for it. He did not want to put up the cheapest building which would give the maximum of well lighted floor space for the minimum of cost. Dignified advertising, he felt, was legitimate, and a building just a little better than the uniform mercantile type he considered good advertising. The difference in cost, in this case, was estimated at 4 per cent.

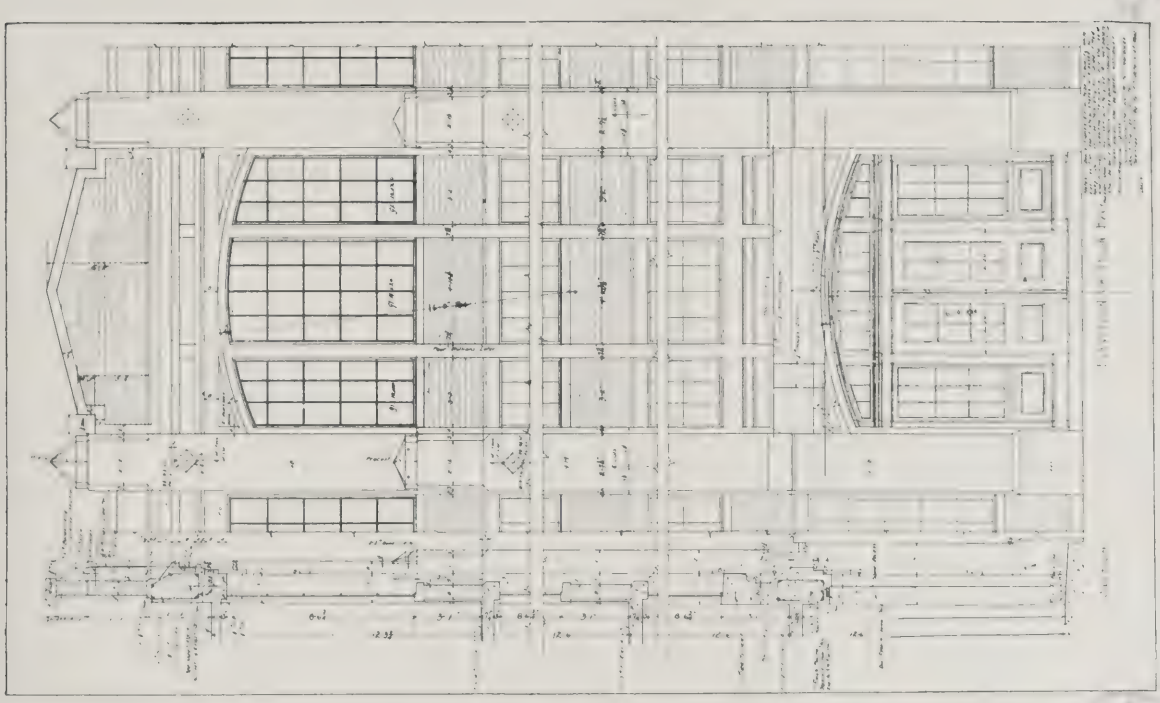
The requirements of the factory were fixed by the methods of making, handling and selling shoes. The floor loads, beams and column centers were fixed by the trade, and the width of the building was fixed by the light efficiency at the machines. The size and height of the tower were fixed by the sprinkler tank, which usually presents an unsightly appearance on the roof. Here, then, was the skeleton, and it remained only to interpret these forms. Here was where the architect and the builder, representing the trades, could meet to mutual advantage.

Before the design was fixed in any of its details, the "pour lines" or where the gang of laborers stopped pouring concrete at night, were determined. Relative to these "pour lines" all the details such as belt courses, cornices, buttress washes, etc., were designed. The amount of detail cast on the ground and raised in place was minimized. Only the washes of the buttresses and their crowning pyramids and the inserted tiles were cast at the site. Again, the design was dependent on the re-use of the same board forms. This, luckily, kept the imagination from inventing too many motifs which do not make for unity. Every insert was so designed that building the general concrete frame of the building could proceed, with openings left for the inserts. This was difficult in places on account of the steel reinforcement coming near the outside surface of the

GENERAL EXTERIOR VIEW

A. M. Creighton Building, Lynn, Mass.

Harold Field Kellogg, Architect



ELEVATION OF PYLON BAY

DETAIL OF LOWER PART OF PYLON BAY

A. M. CREIGHTON BUILDING, LYNN, MASS.
HAROLD FIELD KELLOGG, ARCHITECT

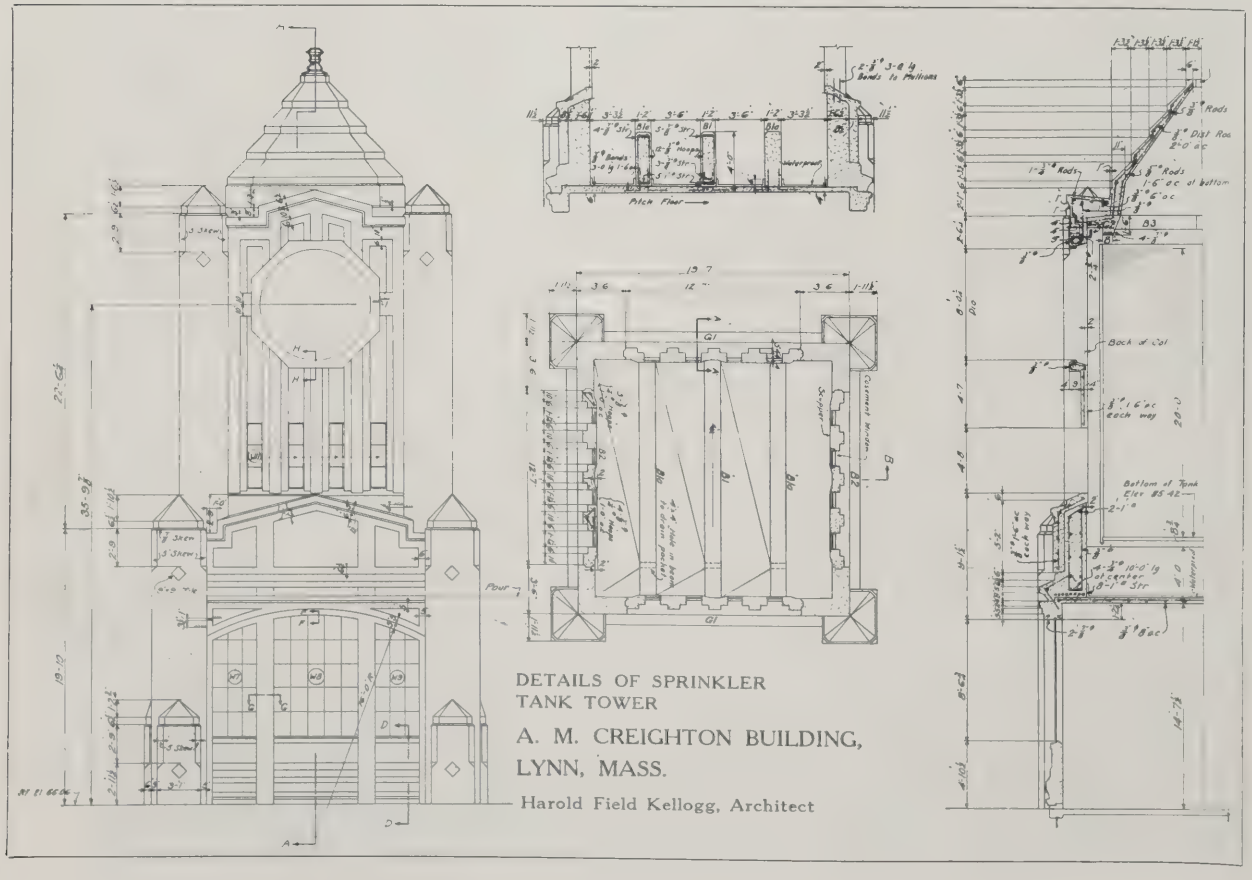
concrete. It was also impractical to leave wires or rods to tie these inserts to, so that each insert had to be in balance without being held in place.

The belt courses and cornices were designed so that the concrete frame could be built without waiting for them to be poured. If the horizontal detail members were poured integrally with the slabs and beams, it would mean that a form the whole length of the building would have to be made. By pouring only a relatively short length at one time, this form could be used over and over again, just as column forms are re-used vertically. This requirement did much to determine the form of the mouldings. All the details were so designed that the forms could be stripped without injury or taking the forms apart. Thus many conferences between the architect and the builder modified the design before construction began. The height and size of the tower were fixed as already said, by the sprinkler tank which it concealed. The added weight was expressed by the buttresses, much like the old cathedrals' multiplied buttresses around their towers.

Carving was, of course, impossible and not desirable in commercial work to any extent. The design, therefore, of the top of the buttresses, which in Gothic work was usually surmounted by a carved finial, was a point to be considered with great care. Here again what was the method of construction? Board forms were to be used and the concrete poured in. If each element required a special board form, the wood from the story below could not be re-used. It was, therefore, advisable to get the effect of a finial by placing something inside the old forms. There were triangular pieces of wood tacked in the corners, the pieces being no longer than a man could reach down from the top to nail in place. Every recess in panel buttresses or reveal was made of 7/8-inch boards as that was the thickness of the common lumber used.

With the circular clock it would seem to be necessary to depart from the straight line dictated by the method of construction, that is the use of board forms. Yet here the circle of the face was placed upon a hexagonal background of concrete which required no bent lumber to construct. The only details where the expression of lintel and column was not followed were the flat arches, really not a concrete form, yet used to attract the eye by a difference of line from the rigid vertical and horizontal. Inside, the building is simplicity itself, except for the owner's private office, the general offices and the waiting room. Here Gothic quartered oak paneling was used, with enough carving to give a domestic touch.

Throughout the progress of the work the architect and builders were in constant touch. Their one desire was to create, with the materials and labor commonly used, something neither commonplace nor yet elaborate. If this co-operation were in more constant practice the building trades would have a greater influence on the architecture of today.



DETAILS OF SPRINKLER TANK TOWER

A. M. CREIGHTON BUILDING, LYNN, MASS.

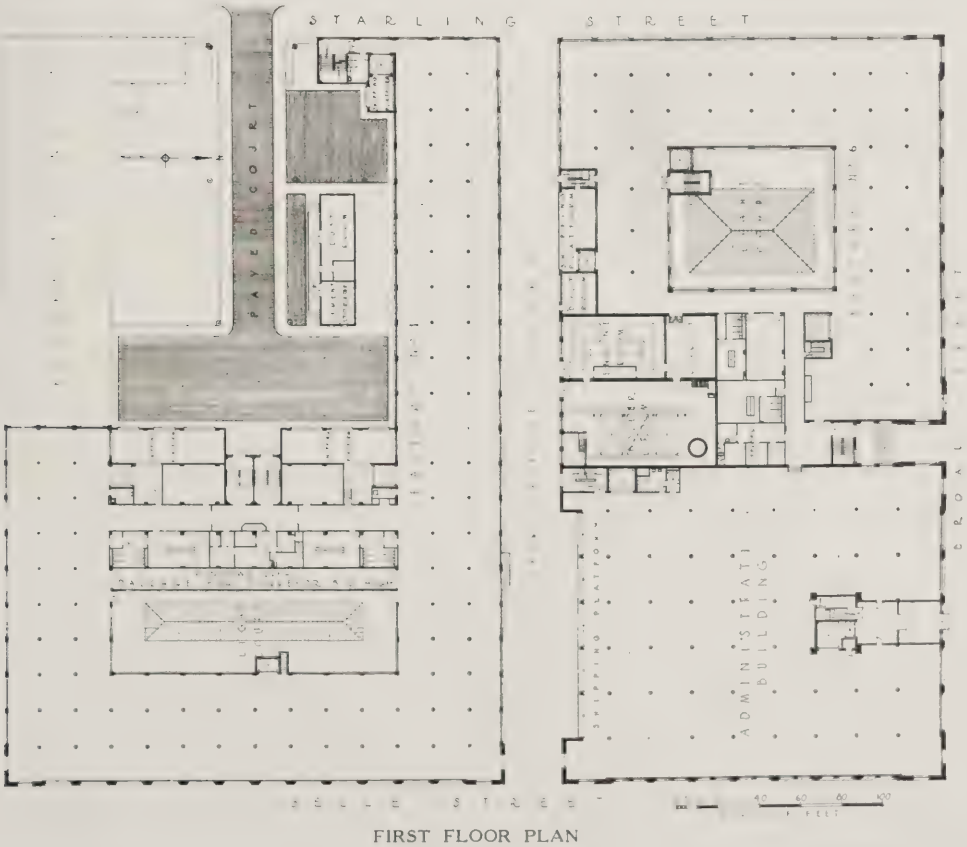
Harold Field Kellogg, Architect

DETAIL OF TOWER AND TYPICAL FLOOR PLAN

A. M. CREIGHTON BUILDING, LYNN, MASS.

HAROLD FIELD KELLOGG, ARCHITECT

PERSPECTIVE VIEW OF COMPLETE GROUP OF BUILDINGS



FIRST FLOOR PLAN

Type of construction: Reinforced concrete flat-slab floors; solid slab and beams for roof where in Factory No. 1 a monitor runs through center bay. Building for manufacturing of shoes.

Exterior materials: Frontage faced with gray brick; Indiana limestone trim. Concrete exposed on other walls. Tar and gravel roof over concrete.

Interior materials: Floors in factory portions, factory maple; elsewhere, monolithic cement.

Heating: Vapor system from central plant. Exhaust fans in basement toilets; plenum system on third floor.

Windows: Side wall factory steel sash.

Date of general contract: March, 1922.

Cubic foot cost: 19 cents, exclusive of equipment; 2,560,420 cu. ft.; cost of power house with equipment, 72½ cents per cu. ft. Factory No. 1 and the power house are now completed.

H. C. GODMAN COMPANY FACTORY, COLUMBUS, OHIO

RICHARDS, McCARTY & BULFORD, ARCHITECTS

BELLE STREET FACADE OF FACTORY NO. 1

INTERIOR OF THIRD FLOOR

ENGINE ROOM

H. C. GODMAN COMPANY FACTORY, COLUMBUS, OHIO

RICHARDS, McCARTY & BULFORD, ARCHITECTS

DETAIL OF END FACADE

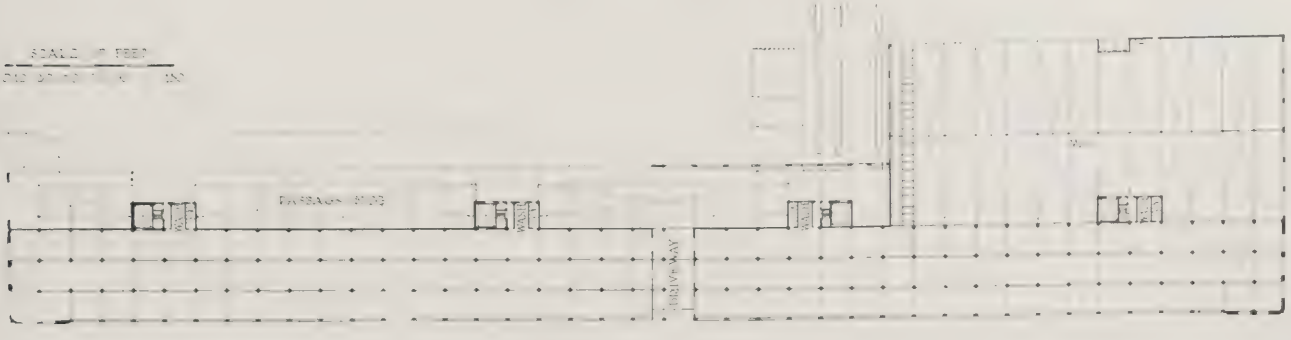
EXTERIOR OF KILN AND MILL BUILDING

WEST END PLANT, FISHER BODY COMPANY, DETROIT

ALBERT KAHN, ARCHITECT

GENERAL VIEW OF EXTERIOR

TYPICAL FLOOR PLAN



FIRST FLOOR PLAN

Type of construction: Reinforced concrete skeleton. Building planned for live loads of 100 pounds per square foot for supported floors, and 30 pounds per square foot for roof slabs.

Exterior materials: Face brick.

Windows: Steel sash throughout.

Use: For the manufacture of automobile bodies.

WEST END PLANT, FISHER BODY COMPANY, DETROIT

ALBERT KAHN, ARCHITECT

Choice of Type of Construction

By JOHN R. NICHOLS
Consulting Engineer, Boston

WHEN the owner of a prospective factory, warehouse, mill, shop, foundry or other industrial building, or his professional adviser, faces the question "What kind of construction?" he has a choice of three generally recognized types, namely: (1) Mill Construction, (2) Steel Frame, and (3) Reinforced Concrete. Varied, indeed, are the circumstances and conditions that, having been given due consideration and weight, will determine the choice. And varied, too, are the modifications and partial combinations of the three types from which may be finally selected a design considered best suited to the situation in hand. It is the writer's purpose, without attempting to be exhaustive either of the subject, or, he hopes, of the reader, to discuss some of the characteristics of the types of construction available and to appraise their value in meeting requirements frequently imposed.

For many years the floors and roofs of industrial buildings have been framed out of wood. In the early part of the era of the power saw, when "two-by's" were the most familiar sizes used by the carpenter, framing consisted of joists or plank on edge, a few inches apart, overlaid with boards. This is termed "joisted" or "close-framed" construction, and is now used chiefly in dwellings. On account of the slender sizes of the members and their close spacing, fire, once started, consumes framing of this type rapidly, and because of the numerous recesses of the ceiling, is difficult to extinguish.

Walls of industrial buildings, too, used to be framed in wood, and to some extent are so framed at the present time. The value of masonry for walls, however, as a protection against the spread of fire, as well as for its durability when exposed to the weather, has long been recognized, and few buildings, other than dwellings and temporary sheds, are now constructed without the benefit of a masonry shell. Masonry walls in industrial buildings may almost be taken for granted.

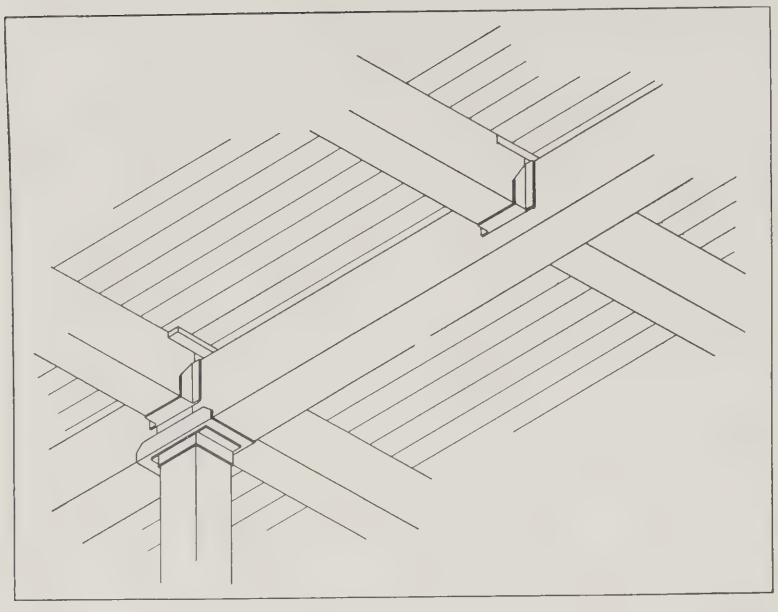
Some few years ago an endeavor originating in textile mills, to improve the fire-resistance of wooden-framed floors and roofs in buildings having masonry walls, resulted in what is known as "mill construction," sometimes called "slow-burning construction." The improved framing sought, by widened spaces between beams,—8 to 10 feet or more,—to bring all surfaces easily within reach of water from hose streams or sprinkler heads; by increasing the sizes of timbers,—no dimension less than 6 inches,—to lessen the combustible area exposed to fire, and to make possible a considerable depth of charring without endangering the load-carrying capacity; and by interposing thick floor planks between stories,—2, or better, 3 inches thick,—to provide a cut-off that would withstand fire and support floor loads for a longer time than the thin boards of joisted framing. The requirements of textile mills are well suited to the use of mill construction in its simplest and most economical form. Floor loads are light, 40 to 70 pounds per square foot, and close post spacing, transversely of 16 to 20 feet and longitudinally of 8 to 10 feet, is not objectionable. The floor beams, running transversely, rest directly on exterior masonry walls and interior posts, the plank spanning from beam to beam. No girders are required.

As mill construction was adopted for uses requiring wider post spacing, longitudinal girders became necessary, themselves resting on the posts and carrying the ends of intermediate floor beams. This is a modification of mill construction sometimes styled "intermediate framing." Although the term "mill construction" is held strictly to apply only to the original form with beams in but one direction, it has come in recent years to be used in the broader sense including all the modified forms of wooden floor and roof construction which embody in substantial degree the essentials mentioned.

Mill construction is not fireproof, even in the limited sense in which the term is properly used, for no construction is proof against all fire. In fact, the structure itself is fuel for the burning. But the heavy timbers resist fire and support their load longer than exposed steel, which gives way when heated, and the type well merits the term "slow-burning." Buildings of mill construction, equipped with automatic sprinklers, often carry a rate of insurance nearly or quite as low as would a fireproof building under the same circumstances.

Column spacing, for economy of construction, should generally be as short as the occupancy will permit. Rarely does this allow going beyond the point where added posts and foundations cost more than the saving in floor and roof framing. When, as in the case of general warehouses, columns interfere little with operation, it may become interesting to consider the purely economical spacing. This depends on so many varying factors that we cannot attempt here more than a generalization. Heavy floor loads, many stories, low story heights and good bearing soil favor close spacing, which will probably never be less than about 8 feet by 14. Conversely, light loads, few and high stories, difficult and costly foundations favor wider spacing.

The direction of beams and girders is determined by a number of considerations. If post spacing is wider in one direction than in the other, the girders, which are more heavily loaded, should be favored with the shorter span. This consideration is important when the use of structural steel for girders is



Isometric view of ceiling in a mill construction building, showing detail at column cap, and method of supporting beams at girders
The floor planking is raised 4 inches above girders

thus avoided. The direction of the boards in the finished flooring is another consideration. The distribution of light from the windows and its reflection from the ceiling are better when beams run across the building.

Yellow pine timbers, chiefly used in mill construction, are not readily available for depths greater than 16 inches. The larger sizes command a premium. Sixteen-inch beams loaded to capacity are subject to excessive deflection in spans of more than 20 feet. For longer spans, the deflection may be kept within bounds by reducing the allowable fiber stress, but the cost then mounts rapidly. For spans greater than 25 feet, steel becomes a close competitor, and considerations of delivery will usually dictate its use.

The girderless form of mill construction is economical for column spacing, at right angles to beams, up to the limit of span for 3-inch plank. This may be 8 to 12 feet, depending on load and allowable deflection. Wider spacing calls for girders to carry ends of beams intermediate between columns. The largest timbers available for girders are good for spans up to about 16 feet, depending on the floor load.

Beyond the limiting spans for timbers, recourse must be had to structural steel. This involves an appreciable increase in cost and, unless the steel is protected against fire at still further expense, a sacrifice of fire resistance. The only gain, aside from the wider column spacing, is increased stiffness. Timber combined with steel, as in trussed beams or flitch beams, had a vogue before the advent of cheap rolled steel, but is cumbersome and in view of the difficulty of joining the materials effectively is rarely found economical today.

Some attention should be given, in spacing of beams and columns, to layouts of the sprinkler system. The reasons for installing automatic sprinklers are first, to reduce the fire hazard and second, to reduce the insurance rate. Having the second object immediately in view as the best guide to attaining the first, the rules of the insurance underwriters are to be observed. In the case of joisted ceilings a sprinkler head is required for not exceeding 80 square feet. Symmetrical arrangement with respect to posts and beams, and extra heads at walls and partitions, will usually reduce the average area per head to about 60 square feet. When the spacing of beams is over 3 feet, the ceiling comes in the class of mill construction, and heads are arranged in relation to the beams, the maximum area per head being 100 square feet. The maximum spacing of heads is 12 feet. Having due regard to the length of bays, therefore, beam spacing of 8 to 12 feet is most easily susceptible of arrangement for minimum number of heads, with a line of sprinklers in the center of each bay. Beam spacing from 5 to 8 feet also calls for a line of heads in each bay, and results in decreased sprinkler spacing, and corresponding expense. For beam spacing between 3 and 5 feet, sprinkler heads are staggered in alternate lines, generally resulting in much less than 100 square feet per head.

It is possible, however, to attach too much importance to sprinkler arrangement. Allowing ten cents per square foot of floor space for sprinkler equipment, a choice of 7-foot instead of 8-foot spacing for beams requires 14 per cent more heads at an added cost of only 1.4 cents per square foot. This would be more than paid for if, for example, the thickness of floor planking could be reduced thereby.

When, for some reason incidental to the occupancy, wider spacing of beams is required than 4-inch plank is good for, either on account of stress or deflection, recourse is sometimes had to use of so-called laminated floors. This construction consists of laying small, square-edged joists on edge close together and spiked solidly through the sides. The only advantage in this over the usual grooved and splined plank lies in economy. The small joists used cost less per board foot than larger sizes, and the expense of grooving and of splines is saved. The object of grooving and splining is twofold: to give an individual plank subject to concentrated load the assistance of its neighbors, and to stop the passage of dirt through the floor. Included with the first is holding the planks to a smooth surface. Laminated floors accomplish the first object fairly, although the task of lining up warped and twisted two-by-sixes is by no means easy. In meeting the

second object laminated flooring fails utterly, and it is hardly practicable in the ordinary course of construction work to keep all dirt and the necessary debris of masonry laying off the floor. Powdered mortar and other fine refuse is ground into cracks, later, when the wood shrinks, to fall from the ceiling below. When shrinkage occurs, some cracks open wide, making the ceiling unsightly. Where these results are not objectionable, of course, advantage may be taken of the possible economy of laminated construction.

In laying laminated flooring the strongest and stiffest floor is obtained by making butt joints between ends of sticks as few as possible, and when they do occur by placing them at about one-fifth the span from the beams. They should always be staggered. The appearance of butt joints on the ceiling may be avoided by placing them over beams, but this reduces the strength and stiffness of the floor. A floor laid with random lengths is the cheapest and is stronger than when joints are over beams, but it lacks something in appearance.

Beams are supported on girders, either by resting on them or by being hung in iron stirrups or beam hangers. When the tops of the beams are level with the tops of the girders, it is called flush framing. Flush framing is objectionable either in floors or roofs, for the reason that when the beams shrink, the tops settle in relation to the girders, and a ridge is formed where planking is forced up along the line of the girders. Better practice is to hang the beams 3 or 4 inches above the girders, and to span across girders with 2-inch pieces resting in notches cut in the ends of the beams. The cost of this is not great, especially when iron dogs, otherwise required to tie together the ends of beams, are dispensed with. Space is thus conveniently provided for the passage of pipes, electrical conduits, wires, etc., on the ceiling.

Posts should not rest on the ends of wooden beams. Either they should be carried down between ends of beams to the column cap or base plate below, or metal pintles should be provided. The latter method has the advantage that the slender pintle permits ends of beams or girders to extend over the shaft of the column below. Its disadvantage is a lack of continuity of the column as a whole, which subtracts somewhat from its lateral stability. When the wooden column shaft itself extends down to the cap of a lower column, the beams and girders necessarily rest on brackets, usually a part of the cap, projecting beyond the face of the lower column. In such cases, cast iron for caps is to be avoided, as in case of fire the brittle metal is apt to crack off and drop the floor. Steel, though it may soften and sag, is more likely to hang on. Caps for top-story columns may be of wood, oak if necessary to avoid over-stressing in bearing across the grain at the column. Wooden columns in the lowest story should have metal base plates, which may be of cast iron, to intercept moisture brought up from the ground by capillary attraction.

Similarly, ends of beams in exterior masonry walls should have metal bearing plates. It has sometimes been the practice to brick in tightly the ends of beams in masonry walls. This frequently leads to rotting and is to be avoided. A space for circulation of air about the end of the beam is desirable, and to insure its thorough provision, sheet metal hoods are provided about ends of timber to keep back brick and mortar.

Wood kept dry lasts indefinitely, but where the moisture content exceeds a percentage, not accurately defined, for a long period, rot is apt to set in, and if allowed to persist will ultimately destroy timber for structural use. Thus in laundries, dye houses, and certain industries where a high humidity is maintained, rot (sometimes, when the moisture is not visible, called dry rot) has frequently caused serious damage to wooden framing. Floors constructed above the ground or over damp, unheated basements have suffered rapid deterioration from this cause. A number of preservatives have been developed which are more or less effective in retarding the growth and spread of rot, but permanence is not assured when dampness prevails.

Interior of office section of The Chilton Company Building, Philadelphia, showing heavy mill construction, inexpensively finished

The Ballinger Company, Architects and Engineers

In industries where arrangement of machinery is subject to frequent change, mill construction is found advantageous on account of the ease with which shafting is secured to the ceiling, machines bolted to the floor, openings cut for chutes, conveyers, etc., and the floors strengthened or reframed to meet changing conditions. Mill construction is rarely used in buildings more than six stories high. This is partly due to lack of lateral stability, which is chiefly dependent on the masonry, and the excessive size of posts and thickness of masonry in the lower stories, and partly to the restrictions imposed by building laws in cities, on account of the fire hazard.

The cheapening of steel manufacture that was brought about by the invention of the Bessemer process has made steel framing economical for buildings, under circumstances which favor its use. In steel framing, a framework of rolled structural steel members, which is entirely stable by itself, is erected on foundations, and the skeleton thus formed is clothed with walls, floors and roof. Members are assembled and joined one to another by means of rivets, although in unimportant structures bolts are used.

Two distinct types of steel-framed buildings are recognized. One follows the lines of mill construction with its beams, girders and interior columns, but with a steel frame taking the place of exterior masonry bearing walls. Buildings of the other type are known as "mill buildings," an unfortunate term, perhaps, which must not be confused with "mill construction." Mill buildings are long structures, usually one story in height, whose distinctive feature is their one or more broad bays free of posts. This type of building is used for heavy metal-working shops such as foundries, boiler shops, etc., where cranes are necessary for handling heavy or bulky work, and where large spaces clear of columns are required. For this type of building steel framing is practically a necessity. No other material is suited to the long spans and the high walls exposed to wind pressure and lateral forces from moving cranes. Sometimes, in temporary structures, timber trusses are used, but the difficulty of making suitable joints with wooden members, and the shrinkage of the wood, loosening the joints, are sources of continual trouble which are only completely avoided by using steel, the result generally justifying difference in cost.

Steel, although not fireproof, is incombustible, and when combined with incombustible materials in the finished structure at least affords no source of fire. In the metal-working trades, for which mill buildings are usually employed, fireproofing of such a structure and fire-protective equipment are superfluous. Corrugated sheet iron for roof and walls, and steel sash are commonly used when the building is not heated. Loss of heat through sheet iron is so great, however, that it pays to use concrete, gypsum, tile or other similar material for the roof, and masonry for the walls, when buildings are to be kept warm. In steel frame buildings which house quantities of combustible material, such as lumber, oil and inflammable chemicals, no advantage is gained by shunning timber for purlins and roof planking. Automatic sprinklers are then of great value. The choice between wood and masonry for walls of such buildings depends upon exposure to fire from nearby structures, or to the degree of permanence desired in the structure.

In other than mill buildings the use of steel for framing has been due to two reasons: First, to obtain structural members stronger than the largest available timber. Second, to employ a material which, when surrounded with a protective covering of concrete, tile or other suitable insulation, results in a fireproof structure, a structure much more resistant to fire than mill construction.

Steel is economical in fireproof construction, in high office buildings, hotels, apartments, etc., where the loads to be carried are light. Reinforced concrete, its chief competitor, is so heavy that the dead load of the structure becomes disproportionate when it is used in the frames of such buildings. For very high buildings, such as the "skyscraper" of New York,

Interior of heavy stamping mill showing typical steel "mill building" construction with craneway under monitor. Plant of Edw. G. Budd Mfg. Co., Philadelphia
The Ballinger Company, Architects and Engineers

steel is a necessity. The weight of reinforced concrete and the bulk of concrete columns in the lower stories, required to sustain it and occupying valuable space, are prohibitive.

Reinforced concrete has had its greatest development as a building material since 1900. The development has been so rapid, however, that today it is well recognized as one of the standard types of construction for industrial buildings. Concrete is an artificial stone and has the brittleness and lack of tensile strength characteristic of natural stone. High in compressive strength, however, it can be reinforced where it is subject to tensile stress by embedding steel rods in it when it is made. The combination of concrete, reinforced with steel properly placed and proportioned, is called reinforced concrete.

Reinforced concrete, properly designed and constructed, is classed as fireproof, and will withstand the destructive effects of fire as well as any of the commonly used building materials. Like all of them it suffers from long-continued exposure to a hot fire, but concrete structures subjected to fire are not usually damaged beyond repair, and are seldom if ever destroyed by it.

A structure of reinforced concrete is practically monolithic. Plastic when placed, successive days' work fits perfectly the concrete previously placed and hard. There is no looseness at joints, or play, affording opportunity for swaying. Concrete construction is therefore well suited for multi-storied buildings containing vibrating machines or machines having heavy reciprocating parts, such as printing presses.

Reinforced concrete in piers and exterior walls is stronger than masonry. Moreover, lateral stability is contributed by interior columns. Exterior columns or piers may therefore be more slender and more widely spaced than in mill construction, and correspondingly larger space is afforded for windows. The so-called "daylight factory" came into vogue with reinforced concrete. When floors are of the flat slab type, ceilings unbroken by beams and windows carried to the ceiling, the light distribution is unequaled. The use of rolled steel sash, with its slender members and large lights of glass, aids the natural illumination.

Reinforced concrete construction is best adapted to buildings having heavy floor loads. For loads in excess of 200 pounds per square foot it will frequently be found cheaper than mill construction. It is therefore well suited to warehouses. In high buildings, heavily loaded, the columns in the lower stories may become bulky and occupy too much valuable space. In this case, however, structural steel embedded in the concrete columns is successfully used to reduce their sizes. Reinforced concrete buildings are durable; sometimes too durable, when alterations are to be made or a building demolished. Cutting through floors is expensive and, if openings are numerous or large, may result in a weakening of the structure which is difficult to correct. Cutting the floor for small pipes, wires, etc., to bring water, steam, oil, compressed air or electric power to machines, wherever they may be placed, is sometimes facilitated by leaving wood blocks in the concrete at close intervals, covered over by the granolithic finish.

With reinforced concrete, as with mill construction, the closest column spacing permitted by the occupancy will be usually found economical. Bays 15 or 16 feet square are perhaps the minimum for economy in warehouses. Concrete, like steel, is a manufactured product, and is not subject to the limitation imposed, by the natural growth of trees, on mill construction. There is no well-defined upper limit on the size of bays. Flat slab, or girderless floor construction is particularly economical for small bays which are square or nearly square. For maximum economy the wall bays and end bays should be 10 per cent narrower than interior bays. Flat slab construction is used frequently up to 25 feet column spacing, and less often to 30 feet. For wide spacing it is very heavy, and the lighter construction of formed beams, girders and thin slabs saves enough concrete and steel to pay the extra cost of forming. Except in high, many-storied

Interior of typical flat slab concrete building, showing use of gloss white paint to increase effective illumination. Tiffin Building, Long Island City, N. Y.
The Ballinger Company, Architects and Engineers

buildings carrying light loads, reinforced concrete is almost always cheaper than fireproofed steel.

Where moist conditions do not prevail, hardwood flooring is probably the best and the cheapest satisfactory wearing surface for floors of factories, not laid on the ground. Matched flooring gives a more even surface, but where heavy trucking is done, square edged is more durable. In buildings of mill construction it is the obvious type of floor finish, nailed directly to the planking. Under wash bowls and isolated wet processes it may be desirable to lay cement, asphalt, mastic or other type of waterproof flooring, but this is always at added expense. Industries which are wet throughout should not use mill construction for floors.

In reinforced concrete and fireproofed steel frame construction, the laying of hardwood flooring is more expensive. A means for supporting the boards and securing them in place must be provided. The usual provision is wooden sleepers, bolted, wired or otherwise secured to the floor, filled between with cinder concrete. The sleepers must be carefully leveled, and to them the flooring is nailed. Hardwood flooring laid in such buildings costs 15 to 20 cents per square foot more than cement or granolithic floor finish laid directly on the structural floor. The requirement of hardwood flooring therefore favors economy of mill construction as compared with reinforced concrete.

For ordinary factory floor loads, when there is no special requirement for floor finish, mill construction costs about 10 per cent less than reinforced concrete, and steel frame, fireproofed, about 10 per cent more. Extraordinary opportunities to purchase lumber, cement or steel may affect the relative costs, even so far as to reverse their order, when other conditions favor, but usually the prices of these materials rise and fall together and proportionately. Subject to favoring conditions already touched upon, the relative costs have remained approximately as given since reinforced concrete came into general use.

Floor loads are usually determined by the building code in cities, and, where there is no code, by an estimate of the heaviest loads likely to come on the floor. Members of a frame which supports small floor areas should be adequate to carry possible heavy concentrations, or local loads more severe than the average. Girders supporting large areas, and posts may be designed for average loads 10 per cent to 25 per cent less than local loads. Columns carrying more than one floor may have the live loads still further reduced. The building codes of cities usually recognize the correctness of this principle and specify definite reductions. It is not applicable to warehouses and buildings which may be fully loaded in all stories.

For the structural floor and roof filling of a steel-framed building, a wide variety of materials and combinations are available. Where the structure is not fireproof, wooden plank may be used and is cheapest and lightest. For fireproof buildings, burned clay products were, until recently, used almost entirely. Brick arches with cinder or cinder concrete filling were common in warehouses and other heavily loaded buildings. Specially shaped skewbacks to rest on the lower flanges of beams and protect them from fire beneath the flanges were provided. Terra-cotta segmental arches were similar to those of brick, but lighter. These are rarely seen today in new construction. Where flat plastered ceilings are required, terra-cotta flat arches, with their skewbacks and flange protection, were used in office buildings, apartments and similar structures and are still used to some extent.

Reinforced concrete has very largely taken the place of brick and terra-cotta segmental arches, and is often used in such structures as office buildings. The slab is placed at the upper flange level, avoiding the expense of filling and its weight. The concrete protection is extended down the sides and beneath the beams. Plastered ceilings may be hung below.

In plastered buildings, flat ceilings with long spans may be obtained economically by using terra-cotta partition tile in combination with reinforced concrete. In this type of floor, the tiles, 12 inches wide and of the necessary depth, are laid on forms with spaces of 4 inches or more between rows, for concrete and steel reinforcing. Usually concrete is placed over the tiles. The terra-cotta is utilized as a permanent form for the concrete and a support for the plaster ceiling. Except that one wall of the tile, when so placed that joints are staggered, may be used to assist the concrete in shear, the terra-cotta serves no structural purpose. This type of floor construction is employed in spans up to 25 or 26 feet in schools, hospitals and other fireproof buildings where loads are comparatively light. The concrete ribs may run in one direction, when the openings in the partition tile are stopped only at the ends of the span, or they may run in two directions, the floor panel supported on four sides.

Gypsum, or plaster of Paris, treated to retard the set, and sometimes mixed with wood chips, has found use recently in the roofs and floors of steel-frame buildings. It is placed in forms and reinforced as is reinforced concrete, but having considerably less strength than concrete, must be thicker. Its advantage is that it weighs only about one-third as much as stone concrete and hardens much faster. In roofs, its property of heat insulation is sometimes of great value. It usually costs more than concrete, though the saving in steel, due to reduced dead weight, partly if not wholly compensates for the added cost of the floor itself. Both gypsum and concrete are made into slabs or tiles and sold by a number of concerns for roof and floor decking. They are useful in non-combustible buildings where the steel is not fireproofed. Cast and hardened before erection, they are placed rapidly, and time is saved by their use as compared with the use of reinforced concrete.

Fire Prevention and Protection for Industrial Buildings

By C. STANLEY TAYLOR

AMONG the more important elements which must be considered in the planning of factory and warehouse buildings are the structural and mechanical provisions for the protection of life and property against loss by fire. It is the purpose of this article to indicate the more important elements which receive consideration and the sources of information and technical service which the architect will find available in developing the various factors of fire protection for any building project which he may be planning. In another article in this issue of THE ARCHITECTURAL FORUM will be found a description of various organizations formed for the purpose of promoting a better knowledge of insurance engineering, together with a bibliography of important codes, standards and authoritative technical literature. The architect is advised to read the article as a source of reference to every problem involved under this consideration. Meanwhile, it is important to note that there are several sources from which dependable technical advice may be obtained without cost to the client, and which will result not only in greatly increasing the factor of safety but will probably bring about a drastic reduction in the insurance rating, for both the building and its contents.

Forms of Insurance

In general, there are two methods under which fire insurance is carried on an industrial building. The first of these is the regular fire insurance policy in an established fire insurance company (stock company), and the second type of insurance is carried in what is known as a "mutual" company, in which the rating is in accordance with experience, and is subject to rebate after losses have been paid for the year and the expense of administering the company's business has been met. The first point, therefore, is to determine with what fire insurance company or type of company the client intends to place his insurance. If the insurance is to be placed with a stock company, this will unquestionably be done through a large agent or insurance broker. Several such organizations maintain well organized insurance engineering departments, which will co-operate directly with the architect and the owner, usually with no charge except an agreement to place the insurance with the co-operating organization. When such arrangements are to be made, the architect will find it highly advantageous to call upon the engineering department of the owner's insurance representative to check over plans and specifications and to make suggestions tending to increase safety and reduce rates. If the insurance is to be placed through a mutual company, a similar service will be found available, as it is an important function of such an organization to reduce hazards wherever possible in risks carried by member manufacturers. In addition to these sources of advice, a number of the larger fire insurance companies maintain insurance engineering departments, and there are also such sources of information as local rating bureaus, the National Board of Fire Underwriters, and others mentioned in another article in this issue.

Rating Schedules as Guides

In the establishment of insurance rates, the rate of premium is standardized as the amount of money charged by the insurer for each $100 of the amount of insurance indemnity contracted for. This rate is in effect established by the amount of risks undertaken by the insurer as based on past experience and statistics gathered during years of painstaking research. Naturally, the greater the risk the higher the premium will be, and it is a policy of insurance interests to encourage all efforts on the part of the owner to safeguard his plant against losses. In establishing the rate of insurance the method commonly followed is known as schedule rating. A basic rate has been established for the class of risk, and a schedule established which adds to or subtracts from this rate in accordance with local hazards and structural and protective measures taken by the owner to guard against a fire loss. There are several rating schedules commonly used, including the Universal Mercantile Schedule, the Manufacturing Schedules, and the Dean Schedules, all somewhat similar in their methods of operation.

It has been said that a properly drawn rating schedule is a convenient and effective expression of the view of underwriters at large upon standards in materials, construction and protection, and is, therefore, a guide to architects and builders who desire to follow the best methods of fire prevention. It is also educational to the public, and has frequently to our knowledge influenced the adoption of better building laws, following the principles laid down in the schedule. It seems, therefore, that such a system should be considered a most important ally, and almost indispensable to the other and, perhaps, better known branches of scientific fire prevention, representing as it must the best thought of all who are interested in that subject, whatever may be their profession. It is obvious that these schedules include a large number of allowances and changes, and that with these as a guide the architect may incorporate in his plans and specifications many points which will be immediately recognized by the local rating bureau. Copies of such schedules are obtainable through insurance companies, agents and brokers or representatives of mutual fire insurance companies.

The Importance of Protective Measures

For full details of structural safeguards and fire protection equipment covering all types of buildings, architects are referred to two handbooks: "Fire Prevention and Fire Protection" (Freitag), and "The Crosby-Fiske-Forster Handbook of Fire Protection." Some of the more important problems affecting the planning and equipment of industrial buildings will be discussed here, but the architect on his individual project is advised to follow the clause already recorded, in asking the co-operation of insurance engineers and in obtaining information and data on his special problems directly from authoritative sources of information. The problem of fire protection in industrial plants divides itself naturally into four parts: First, preventing the origin of fire, and providing for extinguishing it at the point of origin. Second, to prevent the rapid spread of fire through large unprotected areas of floor space. Third, to prevent the spread of fire from floor to floor through unprotected vertical openings, such as stair and elevator shafts, conveyers, etc. Fourth, to prevent the entrance of fire into the building through exterior openings facing or over nearby buildings which constitute a menace as exterior exposure hazards.

Dividing Floor Areas for Safety

The National Board of Fire Underwriters has established a limit of areas which are to be enclosed within fire walls properly equipped with fire doors in order to check the rapid spread of fires. This subdivision of floor areas serves to hold the fire closely to the point of origin, prevents strong drafts, and aids materially in the work of extinguishing. In establishing these limitations of areas, which are sometimes required by local building codes and always by insurance interests, it is primarily a problem of the original design of the building and should be considered as one of the factors influencing the architect's work. The building code of the National Board of Fire Underwriters provides for allowable floor areas in accordance with the tabulations on this page covering various types of buildings:

Non-fireproof Construction—

(a) Tenement houses, 3000 square feet.

(b) All other ordinary non-fireproof buildings, height not exceeding 55 feet.

Fronting on	Without sprinklers	With sprinklers, increase of 66⅔ per cent.
One street	5,000 sq. ft.	8,333 sq. ft.
Two streets	6,000 " "	10,000 " "
Three or more streets	7,500 " "	12,500 " "

(c) Mill construction buildings, height limit 65 and 75 feet.

Fronting on	Without sprinklers	With sprinklers, increase of 100 per cent.
One street	6,500 sq. ft.	13,000 sq. ft.
Two streets	8,000 " "	16,000 " "
Three or more streets	10,000 " "	20,000 " "

Fireproof Construction—

(a) All buildings of Classes A, B, C and D; Light and power stations; Office buildings } No restrictions as to area.

(b) All other buildings not exceeding 65 feet in height.

Fronting on	Without sprinklers	With sprinklers, increase of 66⅔ per cent.
One street	10,000 sq. ft.	16,666 sq. ft.
Two streets	12,000 " "	20,000 " "
Three or more streets	15,000 " "	25,000 " "

(c) Stores, warehouses, factories and workshops not exceeding 85 feet, and other buildings not exceeding 125 feet in height.

Fronting on	Without sprinklers	With sprinklers, increase of 50 per cent.
One street	7,500 sq. ft.	11,250 sq. ft.
Two streets	10,000 " "	15,000 " "
Three or more streets	12,500 " "	18,750 " "

(d) The first floor only of any fireproof building occupied as a store may have an area of 20,000 square feet, and if fully protected by approved automatic sprinklers may be increased 50 per cent, or have a maximum area of 30,000 square feet.

NOTE: Attention is directed to a document entitled "Allowable Heights and Areas for Factory Buildings," distributed by the National Board of Fire Underwriters.

Interesting extracts from the National Board Building Code relative to slow-burning construction specifications call for fire walls of brick, and brick laid in Portland cement mortar, or reinforced concrete. Non-bearing walls shall be not less than 16 inches thick in upper four stories or upper 50 feet, increasing 4 inches for each two stories or fraction thereof below. No such two-story increment shall exceed 30 feet in height. Parapets are to be full thickness of wall, extend at least 3 feet above the roof at all points, and to be coped with durable material. No timbers let in from opposite sides of wall are to have less than 8 inches of solid masonry separation. All openings in walls are to be protected with approved fire doors on each side of the wall. Mill construction building heights are limited to 65 feet from curb to roof. This same code provides vertical openings in brick or reinforced concrete shafts with minimum thickness of 12 inches and 8 inches respectively, parapeted 3 feet above the roof and with openings protected by fire doors.

The vertical openings in a factory which should receive primary consideration include elevator shafts, and emergency exits such as smokeproof towers. The smokeproof tower is a particularly favored means of egress in case of fire, and has the primary advantages of forming a cut-off fire and smokeproof stair shaft to which employes become accustomed by constant use as a means of floor to floor communication, and the use of which in case of fire does not develop that form of nervous panic which is customary where outside fire escapes are used. This shaft can also serve as a safe location for the standpipe of a private or public fire protection water supply and a factor of vital importance. In the construction of the smokeproof tower there are essential features of the specifications:

Walls: To be brick, concrete or tile, and to be self-supporting except in fire-resisting buildings. To have no openings except to outside of building.

Stairs and Landings: Preferably non-combustible. No winders to be installed. Stairs to be not less than 44 inches wide. Landings to be at least as deep as the stairs are wide, except at the door landings, where depth shall be 1 foot additional.

Classification of Available Approved Fire Doors and Shutters by Forms in Which Commonly Used and by Suitability to Different Situations

Column	1	2	3	4	5	6	7	8	9	10
	Fire Doors and Shutters	Forms in which commonly used			Class A	Class B	Class B	Class C	Class D	Class E
Line	Type of Construction	Sliding	Swinging	Counterbalanced	Fire Walls	Elevator Shafts	Stair Enclosures	Corridors & Partitions	Severe Exterior Exposure	Moderate Exterior Exposure
1	Tin-clad, 3-ply	A,G,2	A,G,2	A,N	A,G,2	A,G	A,G	A,N	A,G	A,N
2	Tin-clad, 2-ply	A,G,4	A,G	A,N	U	A,G,2	A,G,3	A,G,3	A,G,1	A,G,3
3	Sheet metal	A,G,1	A,G,1	U	A,G,1	A,G,3	A,G	A,N	A,G,1	A,G,2*
4	Solid steel	A,G,3	A,G,3	U	A,G,3	A,G	A,G,2	A,N	A,G,2	A,G,3
5	Rolling steel	B	B	A,G	A,G	A,G,2	U	N	A,G,2	A,G,2*
6	Hollow steel	U	A,G,1	U	A,G,4	A,G	A,G,1	A,G,1	U	U
7	Counterbalanced Elevator	B	B	A,G	U	A,G,1	B	B	B	B
8	Metal-clad	U	A,G	U	U	A,G	A,G	A,G,2	U	U

*Metal frame, wire glass window is first choice.

Doors: Doors to swing into shaft, except at point of exit where they should swing outward. Doors to be hinged upon the down side wall, so as to swing with the travel. No locks whatsoever shall be placed upon tower doors. Doors to vestibules or balconies may be locked by bolts on inside, so arranged as to be easily operated. No padlocks requiring keys to be allowed.

Balconies and Vestibules: Floors to be non-combustible and to be solid. Rails to be not less than 3 feet, 6 inches high. Width of platform to be at least 44 inches.

Illumination: A separate circuit from switchboard to supply each tower, and wires to be carried in conduit from switchboard to the tower. Lights to be provided in each story, and preferably so arranged that all lights can be turned on from switches placed in tower near doors, and in building near the doors at entrance to balconies or vestibules. The sign "Fire Escape Lights" should be painted on the wall near the switches in the building.

Where stairs are located in fireproof shafts directly connected to the building, it is quite possible they will be useless in case of fire above any point where a door may be left open. This form of exit is generally used, however, in factory buildings, and essential features to be considered for inside stairs of this nature include:

Doors should swing with the travel or slide across it.

Stairs should be broad, easy and free from winders.

Continuous railings should be provided on both sides of stairs.

Ventilator of liberal area should be placed on roof to carry off smoke which may enter the shaft.

In many locations, stairs should be carried to roof.

In any case, stair enclosures should take the form of a shaft rather than be individual for each flight of stairs, as in this manner a fair means of escape will be provided. All elevator shafts should be constructed according to the best practice of fire protection, and should be arranged with solid walls and fire doors of a type which will be described in later paragraphs. If the elevator is operated by electric power, great care should be taken to safeguard the current supply against interruption in case of fire. (See N.F.P.A. publications for methods.)

For the protection of openings in fire walls many types of fire doors have been developed. The best practice for the architect is to obtain from the Underwriters' Laboratories a report of tests on various types of fire doors, which will indicate the margin of safety provided. The National Board of Fire Underwriters has a booklet entitled "Protection of Wall Openings," which deals with the installation of fire doors, shutters and wire glass windows, and explains the different types of door construction permitted in different situations. As a matter of reference the authors of the "Crosby-Fiske-Forster Handbook of Fire Protection" have originated a tabular form giving approved types of protective coverings for various situations and indicating their opinion of the range of good practice and of what is the best ordinary practice. This chart is printed herewith, and in this connection these lettered symbols may be noted:

A. Approved for use in situation shown.
B. Barred for use in situation shown, on account of design.
G. Good practice to use in situation shown.
N. Not good practice to use in situations shown.
U. Unapproved or unsuitable for use in situation shown.

This tabulation should be interpreted thus:

a. Classes A to E are those of the National Board of Fire Underwriters, appearing in the rules on "Protection of Wall Openings."
b. Types of construction of doors and shutters are those approved by the Underwriters' Laboratories.
c. Form in which commonly used indicates which types of construction are found in form of sliding, swinging, and counterbalanced doors. Except in the case of rolling shutters, all types of construction could be made in all three ways.
d. Through the medium of letters and figures, the authors have indicated what is approved, unapproved, and unsuitable for use, what constitutes good practice, and what, in the opinion of the authors, is the very best practice in each situation.
e. It is to be noted, of course, that in time changes may be made in practice, as, for example, hollow metal doors used in sliding and counterbalanced form. There may have been some instances of doors being used in forms not indicated in tabulation, but this tabulation is intended to show well established practice.

The term "counterbalanced" technically does not apply to a rolling shutter, although such shutter is counterbalanced by springs. Vertically counterbalanced doors (objectionable from an accident hazard and blocking exit standpoint) and elevator doors counterbalanced on each other are both included in the tabulation under the heading of "counterbalanced."

An important contributing element to the fire hazard in industrial buildings is the exposure hazard which involves protective measures against an immediately adjacent risk, a hazard which is considered in insurance rating and charged for in accordance with the protective measures employed. There is also to be considered protection against an extended conflagration, and finally there is the communication of flames from one floor to another through exterior openings.

Everett U. Crosby has summarized the possible causes of exposure fires thus: "Exposure and conflagration possibilities from grouped risks are due to fires extending from one building to others in view of the following cases: (a) fire in the individual risk passing beyond control; (b) effect of the size of the risk, viz., the amount of combustible material comprising the building and contents subject to burning at one time; (c) fire extending out through wall openings and through roofs; (d) fire entering through wall openings and through roofs; (e) fire spreading, due to the falling of burning rooms, floors, and contents; (f) fire spreading due to falling walls of a burning building; (g) influence of street widths and open areas; (h) influence of prevailing winds; (i) the 'range' of or territory affected by heat waves and fire brands; (j) adverse conditions of the weather or of the fire facilities."

If the proposed structure is located in an isolated position, the exposure hazard is naturally greatly decreased, and it is unnecessary to take most precautions in its regard. Otherwise, care should be taken to provide as few window or door openings as possible in close proximity to an exposure risk, and to protect these openings with wire glass, shutters and even sprinklers so that there will be little chance of fire passing into the building. In factory buildings it is important that all window frames and sash be of an incombustible matter which will serve to prevent the communication of exterior fire or fire passing from floor to floor. The most successful types of windows have frames, muntins and sash made of variously shaped rolled steel sections with patented methods of interlocking the vertical and horizontal muntins. Where there is any exposure hazard these windows are usually equipped with wired glass which serves an important purpose in retarding the entrance of flames. For additional protection it is customary to install fire-resisting shutters, of which there are several types, including tin-covered shutters for which standards have been developed by the National Board of Fire Underwriters and the Underwriters' Laboratories; sheet iron shutters, corrugated iron shutters and rolling steel shutters, of which the automatic type has been approved by the Underwriters' Laboratories. These rolling steel shutters are particularly valuable as they form a fireproof curtain which is automatically released in case of exposure fires and which have proved invaluable for this type of protection. Other types of window frames and sash which might be mentioned include hollow sheet metal windows and kalamein windows. Another possible method of protecting window openings is the use of double-glassed sash having an air space of at least 1 inch between the sash, and this type of sash is used where it is probable that inflammable contents of the building may be stored within 3 feet of a window, and serves to prevent the actual radiation of heat sufficient to ignite such stored material. In connection with all window and door openings and in the protection of vertical openings it is impossible to stress too greatly the importance of wired glass, which has the advantages of retaining its position under the effect of great heat and preventing rapid communication of fire and the opening up of channels and danger traps.

It is impossible to treat fully the importance of automatic sprinklers for use in reducing the fire hazards in industrial buildings. It is sufficient to say that practically all industrial buildings are equipped with automatic sprinklers, and that insurance rates are reduced to a comparative minimum in buildings which are completely sprinklered.

Of considerable importance in connection with the water supply for fire protection is the question of standpipes, hose racks and roof nozzles. According to Freitag, the possible great value of adequate standpipe installation and maintenance, especially in buildings of considerable height, is seldom fully appreciated by architect or owner. The provision of such protection is too often perfunctory, to cover some requirement in the local building laws or some regulations of the fire department rather than to provide and maintain suitably a fire protection auxiliary which is very likely to prove of the utmost importance. A proper and efficient standpipe equipment must satisfactorily cover many details which should not be relegated to any plumber in a haphazard fashion, but should be most carefully considered. Such details include location, capacity, water supply, valves and street connections, character of hose racks and hose, roof nozzles for particular use under conflagration conditions, or during fire in adjacent premises and, last but not least, some system of adequate inspection and maintenance.

The location of standpipes should be in or adjacent to stairway shafts, so that they may be readily found and used by either tenants or firemen, and they should invariably be located in some chase or flue which will protect them against possible injury by fire or falling debris. Details as to size and capacity of standpipes may be obtained from various sources already mentioned, as may also adequate information as to hose, hydrants and other equipment. The value of other pipe service, especially if equipped with roof nozzles, is important in connection with exposure fires. Many instances have been recalled where exposure fires have been prevented by the use of a roof nozzle. Full recommendations for this equipment may be obtained from the National Fire Protection Association.

Roof Types and Roof Surfaces

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President, The Ballinger Company, Architects and Engineers, Philadelphia and New York

A THOROUGH treatment of the subject of roof types and roof surfaces would require the compilation of a vast amount of detail showing many ramifications of modern practice. To encompass this field in a brief space requires much elimination and a rather cursory treatment of the major problems involved in roof design. The principal points discussed are structural types, roof materials and surfaces, condensation, and the prevention of leaks.

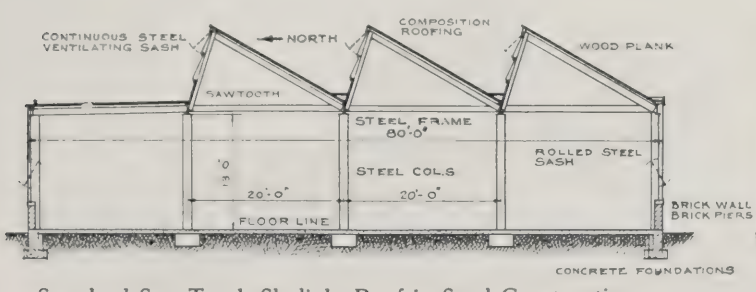
The simplest form of roof construction is a flat roof supported on beams, girders and columns. Either wood alone in heavy mill construction, or wood beams on steel girders and columns, or all-steel construction is used in this type. Wood plank generally forms the structural surface. Due to the many columns necessary to support an extensive roof of this kind, it is employed in industrial work mostly for small or temporary buildings or for warehouses in which the material to be stored does not require large, unobstructed floor areas. It is, however, frequently used in concrete construction of the beam and girder type. Flat slab concrete construction is essentially the same structurally.

To procure longer spans between columns, trusses of various types are employed, the commonest being the "A" type, giving a roof of distinct pitch in two directions, and the Howe truss, giving a more or less flat roof. The "A" type truss is commonly used without columns for spans up to 60 feet and occasionally for greater widths, and is built of either wood or steel. The relatively sharp slope of this roof, when used with monitors or other ventilators at the ridge, assists in ridding a building of heated air or obnoxious fumes that are lighter than air, as the gases rapidly seek the highest point and pass out through the openings provided.

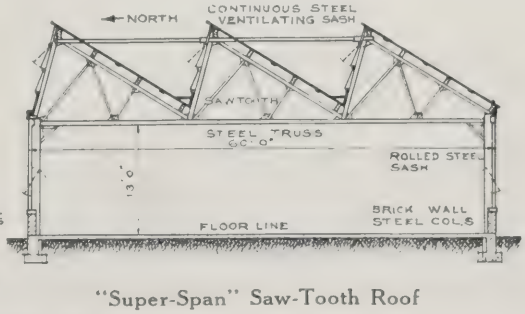
Where high humidity must be maintained within a building, as in many textile mills, and where condensation of the moisture with the resulting dripping must be avoided, it is important that there be no obstructions to the free passage of the air along the under side of the pitched roof from the low point to the ridge. Should the moisture-laden air be interrupted in its flow by a purlin placed horizontally, for example, the air caught by the pocket thus formed would tend to give up its moisture due to the prolonged contact with the cool roof. The water condensed at this point would drip from the roof and purlin, while the air after cooling would tend to descend out of the pocket to be replaced by more moisture-laden air, the process constantly repeating itself. By keeping the heated, moist air rapidly moving to the ridge and out of the ventilators, much of the condensation is avoided until the air is actually outside the building.

When a structure of considerable area is to be roofed, columns become necessary. To combine a series of "A" trusses would result in deep valleys over each row of columns. Consequently, where long spans are required with columns at relatively remote intervals and when ventilation is not a primary requirement, the Howe truss or some one of its related types is used. Clear spans up to 80 feet are common with this truss, and greater widths can be bridged if the cost is not too great a factor. A characteristic of this type of framing is that it requires additional height in a building at the eaves in order to accommodate the truss above the clearance established for the lower chord. Roughly speaking, the height of a Howe truss is one-eighth of its span; hence for a 100-foot span the upper chord bearing the roof would be approximately 12 feet above the lower chord. This adds to the cost of the wall construction, and it adds materially to the cost of heating and conditioning this extra volume of air, whenever such is necessary.

Both the "A" truss and the Howe truss are commonly surmounted by monitors which take various forms. The most frequently used monitor consists of two parallel rows of glass on either side of the ridge, with a pitched roof above them, the slopes of the monitor roof being approximately the same as for the main roof. Sometimes a straight roof, pitched to drain in one direction only, is employed on the monitor. A variation of this monitor consists in having its roof surfaces pitch downward to the center, forming a V, the bottom of which is

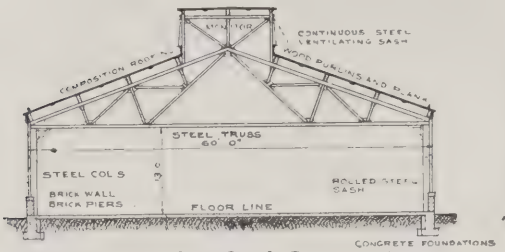


Standard Saw-Tooth Skylight Roof in Steel Construction

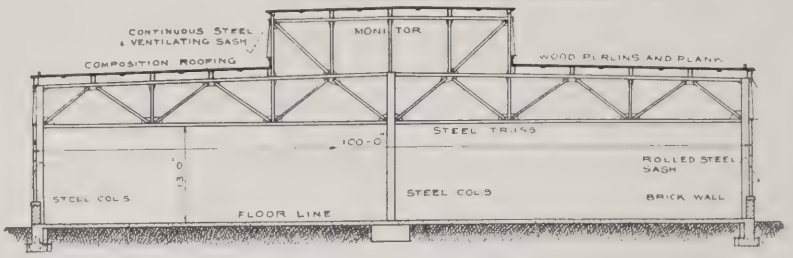


"Super-Span" Saw-Tooth Roof

Patented by The Ballinger Company, Architects and Engineers



Monitor Roof in Steel Construction, Giving Good Light and Ventilation



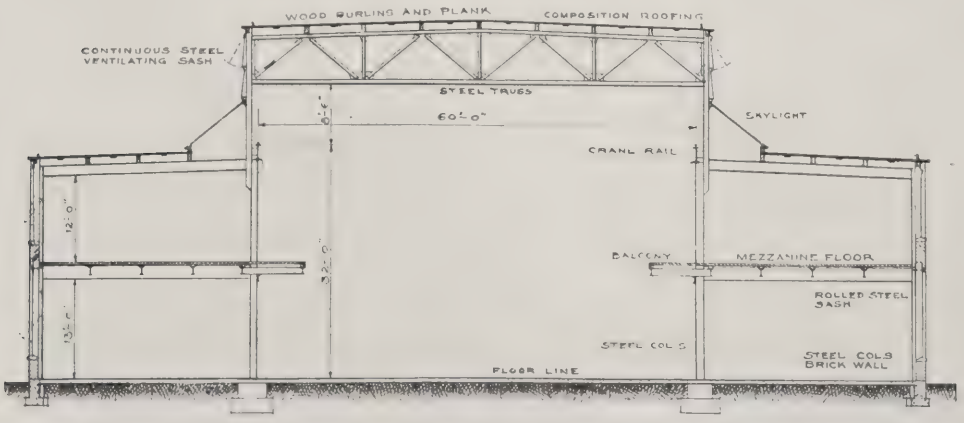
Wide Monitor Type, Providing Space Above Bottom Chord of Truss for Ducts and Piping

generally at the same level as the ridge of the main roof. The purpose of this reversed form is to eliminate any air pocket, and to assist in the complete removal of moist air or undesirable fumes. As will be noted, this kind of monitor places the windows at the highest point. A modification of this kind of monitor is formed by continuing one surface of a pitched roof beyond and above the ridge for a short distance, and connecting this false ridge with the other roof surface by means of glass sash set at a slope of approximately 3 inches to the foot away from the vertical. The resulting monitor is thus one-sided, combining the characteristics of a sawtooth roof with an "A" truss framing. The glass in these monitors is generally faced only to the north as in sawtooth buildings to eliminate sun glare and heat, but sometimes it is placed in alternating directions in every other bay without regard to compass points. In this case the function of the monitors is primarily that of ventilators.

The "high and low bay" roof is useful where long spans are desired with monitor lighting. In this type, the building is spanned crosswise with a series of flat or Howe trusses spaced at regular intervals. Beginning at one end of the building the roof is placed at the level of the bottom chords. The roof between the first and second truss is at the level of the top chords and rests upon them. The roof between the second and third truss is again placed down at the bottom chord, and so on down the length of the building. The vertical faces of each truss carry ventilating or rigid steel sash, so that every other pair of trusses constitutes a monitor with glass sides. By this simple scheme the depth of a Howe truss is utilized with a minimum of waste space requiring heating and air conditioning.

Monitors may function both as ventilators and skylights. Under certain conditions the admission of direct rays of the sun through monitors is objectionable because the illumination of the interior is very "contrasty," with bright, sunny spots and dark shadows. Furthermore, skylights admitting the sun's rays act as greenhouses; that is, the heat of the sun enters, which is often undesirable, especially in summer and in plants that are otherwise overheated. To overcome these objections, sawtooth roofs are used, consisting of a series of parallel skylights facing the north, and having the glass so placed as to receive none of the direct rays of the sun. The glass may be placed vertically, but a greater lighting efficiency results from sloping the glass to the angle corresponding to the deviation of the sun from the meridian at the summer solstice.

Sawtooth roofs are constructed entirely of wood or may be entirely framed with steel or concrete. Generally each valley is supported by a row of columns spaced from 16 to 25 feet apart, though greater spacing may be obtained with ordinary I-beams of sufficient depth. To get long spans several methods are employed. A Howe truss may be used in back of the glass in a perpendicular position from the peak of the skylight or sloped to correspond with the angle of the glass. Owing to the depth required for this truss it is practicable only up to 60 or 70 feet. The use of a Howe truss transversely to the sawteeth and beneath them permits of somewhat longer spans, but the cost is greatly increased. This is because the truss requires from 8 to 12 feet of extra height to the building, and from 8 to 12 cubic feet of wasted space to be heated and conditioned for every square foot of floor area.



Three-bay Monitor Type, with Crane Rail and Side Aisles and Balconies, for Forge Shops and Heavy Manufacturing

An economical method of framing sawtooth roofs without columns has been developed and patented by the writer and is called "Super-Span" construction. The system employs both longitudinal and transverse trusses. In back of the glass is an ordinary truss as just described, which supports the roof longitudinally for distances up to 60 or 65

feet. These trusses in turn are supported (at 60-foot intervals) by a heavier transverse truss, whose bottom chord is at the same level as the valleys and whose top chord extends outside the "sawteeth" connecting their peaks one to the other, the structural members of the skylights becoming the struts and braces. It is somewhat like an ordinary bridge truss except that the angles of the web members are not equal in each pair. Reference to the accompanying illustration will clarify this point. With this system of framing, spans of 100 feet in width (transversely to the skylights) and of any length whatever are constructed at only slightly greater cost (for the building as a whole) than for a sawtooth roof supported on columns under each valley. If widths greater than 100 feet are to be roofed, a row of columns about 60 feet apart is required for each additional 100 feet, giving a column spacing of 60 x 100 feet.

Interior of Ardross Worsted Co. Weave Shed, Philadelphia
"Super-Span" Saw-Tooth Roof, Spanning Room 88 by 168 Feet
Note Ventilating Sash and Operating Device

A fourth kind of roof framing is the wood or steel truss of arch form, suitable for spans of considerable length where very light roof loads are to be carried. They are frequently used for garages or small armories, but when built of wood are not highly considered by fire protection engineers on account of the small dimension lumber used to build up their lattice webs and laminated chords. Two types may be distinguished, the first consisting of a curved truss built up of wood, in which the upper and lower chords are both arched and are nearly parallel to each other. The web members are placed much the same as in a Howe truss. A steel or iron rod in tension connects the ends of this truss like the string to a bow, and takes care of the thrust of the roof. The usual spans for this roof range from 60 to 100 feet. The second type, which is generally built up of laminated wood members, has an arched upper chord and a flat lower chord, the whole forming the segment of a circle. The latticed web members of this truss are arranged according to a rather complex system, and several effective methods of construction are controlled by patents. Spans as great as 100 feet have been bridged occasionally with these segmental trusses.

Skylights are used on all types of roofs, sometimes even in conjunction with monitors. There are two kinds—those that have their glass near to and parallel with the roof surface, called "flush" sky-

View Showing Beam Forming Top Chord of "Super-Span" Truss
Building Will Be Extended from End Wall

Exterior Showing Blank Wall on South Side to
Prevent Sun Glare

Weave Shed, Ardross Worsted Co., Philadelphia
The Ballinger Company, Architects and Engineers

Concrete Monitor Construction with Movable Steel Sash
Tiffin Building, Long Island City, N. Y.
The Ballinger Company, Architects and Engineers

lights, and those having their glass in various arrangements on frames extending well above the roof surface, called "standing" skylights. Flush skylights are used principally on pitched roofs of distinct slope where their shallow frames are not likely to be flooded, and function almost entirely as windows rather than as ventilators. Standing skylights take many forms, but very commonly have tops shaped like a hip roof with plain or ribbed glass held in light metal or wood framing. The sides of the skylight may be of glass or metal, but very frequently have ventilating sash like that used in monitors. When ventilating sash is not used other forms of ventilators are employed, as these skylights are mostly used over elevator and stair wells or light courts through which warm and foul air rises and is removed.

Turning now from roof structure to the materials of construction, we face an even broader field. First to be considered are the materials used for the structural roof itself—the substances used to span the spaces between trusses or purlins, on which the upper waterproof surface is placed. Wood plank is largely used because it is inexpensive and is a fairly good non-conductor of heat and therefore helps to reduce the heat loss from the building and to minimize condensation on the under surface. It is objectionable in several ways, however, the principal disadvantages being that it will rot, and that it is combustible. The tendency to decay may be counteracted by various chemical treatments, some of which are sufficiently inexpensive to warrant their use. Wood may be used in the presence of many chemical fumes that would destroy metal or masonry construction. Concrete is much used for structural roofs where the rest of the building is of concrete. It has many merits, particularly for roofs of flat pitch. Various systems of construction are used, employing gypsum tile, metal tile, burned clay tile and the like, or using ordinary beam and girder or flat-slab construction. Concrete requires some insulating layer to prevent excessive condensation under certain conditions. Gypsum in various forms is coming into wide use because it is a non-conductor of heat and therefore reduces condensation to a minimum. In this respect it is about as effective as wood. Gypsum is non-combustible, permanent, and of light weight, and is easily handled. Except under acid conditions, gypsum is generally preferable to wood plank and costs but little more.

There are several methods of laying a gypsum roof. One method employs a roof tile or small slab set in angle irons or inverted T's. Another uses a much larger slab of gypsum containing suitable reinforcement. A third uses a stiff gypsum board resembling a prepared plaster board which is rested on iron framework of the type used to support gypsum slabs. Reinforcing steel is placed above this board, and then a gypsum cement is poured over the whole, the board acting as a form that is left in place. A similar method uses a temporary wood form as for flat-slab concrete work, with light I-beams at proper intervals. Gypsum cement is poured over wire reinforcing as in the last case.

There are a number of substances which not only form the structural roof surfaces but also have suitable weatherproof surfaces which are used without top membranes or other surface treatments. Commonest among these is corrugated galvanized iron, which is much used for low cost temporary structures. It is probably the lowest in first cost of any roofing material. Its use is limited by the fact that it will rust in time, that it is attacked by many gases and chemical fumes, and that it is an excellent conductor of heat. This last characteristic connotes that much heat is lost through the roof in winter and that it will be unduly hot in summer sunshine, and furthermore that under humid conditions moisture will rapidly condense on its under surface on cool days. To overcome the deterioration of galvanized iron and yet retain its relative economy and simplicity, it now comes with both surfaces (and even the edges) covered by one or more layers

of asbestos paper firmly cemented to the metal. A great improvement in the life and usefulness of the material has been achieved by this process, although the conductivity has not been lessened sufficiently to eliminate this factor.

Corrugated asbestos or even plain asbestos sheets are used in much the same manner. This material is less subject to deterioration even when exposed to many chemical fumes. It has low heat conductivity and is therefore less liable to permit condensation, although the thinness of the sheets does not afford sufficient insulation when there is any very great difference in temperatures to be combated.

Corrugated zinc is now being placed on the market and offers certain merits useful in special cases. Zinc will not rust, and therefore a roof of this material will have a high salvage value, suggesting its use for buildings of only a semi-permanent nature. It has a low melting point and would be destroyed by a fire in close contact with it. It will resist corrosion of some fumes, but is readily attacked by other chemicals. Like iron roofing, it is highly conductive.

Corrugated wire glass is similar to the types of material just mentioned, having aside from its translucency the qualities of permanence and resistance to practically all forms of corrosion. If securing daylight were the prime requisite of a structure, there is no reason why the entire building might not be made of glass supported on a steel framework. The disadvantages of glass are its high conductivity, its weight, and its brittleness. Though wire glass will not shatter under an impact, the cracks that result will admit water unless cemented. The motion of a building, due to temperature changes, wind pressure, or internal stresses, requires a flexible setting for the glass, which is now entirely practicable.

Detail of V-Shaped Monitor Roof, Showing Drainage and Cement Tile Covering

Concrete tile of fairly large dimensions are now on the market and may be used alone directly on the steel channels whenever air leakage and condensation are not factors, as in boiler houses and foundries. They are adapted only to steep pitch roofs, but require no further surfacing. Wood, concrete, and gypsum roofs require the protection of a waterproof or rain-shedding surface material to give satisfactory results. On roofs of steep pitch, materials that will shed water are sufficient, while on flat or low pitch roofs a waterproof membrane must be constructed, on which water can stand.

Shingles, slate, and tile are the principal water-

Maxwell Motor Company Plant, Detroit
Saw-Tooth and Monitor Type Roofs Covered with Interlocking Cement Tile with Glass Insert Slabs

shedding materials, depending on their overlap and the pitch of the roof to prevent rain from penetrating. Shingles of wood are now seldom used, but prepared shingles of felt paper, of felt with a stone surface, and of asbestos cement are commonly employed in industrial construction. Choice depends on the factors of cost, permanence, fire resistance, and appearance pertaining to any given problem. Slate and tile are somewhat heavier materials, having similar qualities, with like factors governing their choice.

Metals are also used on roofs of steep pitch, copper, tin, and zinc being the materials most employed. The metal sheets are crimped together at the edges and are soldered at all flat seams. The vertical seams are frequently left standing. Copper possesses ideal permanence under most conditions, its use being restricted largely by the expense. Tin is the least expensive in first cost, but requires regular painting to protect it from corrosion. Zinc is quite new to this purpose, but it appears to have a place between copper and tin, and will doubtless prove satisfactory when its possibilities and limitations are thoroughly understood.

Flat roofs or roofs having valleys where water may collect, as in sawtooth buildings, require that the roof surfaces be made absolutely impervious to water. Pitch or asphalt with layers of paper or felt, and frequently with a surface of gravel or crushed slag, are the materials employed to form a watertight membrane. The process employed is well known, generally consisting of the application to the roof of a layer of hot pitch or asphalt, over which is a layer of paper or felt, then another layer of binder and another of felt until four or five layers of the tar and three or four layers of the webbing have been laid. All seams are overlapped as each layer is added. On the last coat of tar fine gravel or ground slag is spread to form a protective surface, keeping the sun from melting the binder.

The characteristics of the several materials employed vary slightly. Pitch has a lower melting point than asphalt, and will melt under a hot sun and gradually work down the slope of a roof unless protected by gravel or slag. Asphalt does not need this protection and may be left black, although this practice is not desirable on sawtooth roofs, as a light surface greatly increases the amount of light entering the adjacent skylights. The webbing may be of felt paper impregnated with pitch or asphalt or asbestos felt impregnated with asphalt. The only choice in the use of gravel or crushed slag is to get the cheapest, as either is satisfactory.

When flat roofs are used to walk upon, as for play areas or for promenades, it is best to provide a more durable wearing surface over the waterproof membrane. Concrete may be used for a low cost job, if expansion is provided for; otherwise quarry tile or small slates are set in asphalt.

For temporary buildings, and where first cost is an important consideration, prepared roofing made of layers of tar and paper or felt are on the market in great variety, many having a stone surface rolled on. They are laid with a cemented lap, and if properly laid are practically the same as a built-up roof of equal weight. However, the human factor counts in this work to such a degree that a more permanent roof generally results when there are three or four laps in the thickness of the roof than when there is only one; in other words, a built-up roof may have imperfect laps on one or two layers and still be tight, but a prepared roof depends entirely on the tightness of a single lap. On the other hand, roll roofing may be economically laid on sloping roofs where the tightness of the lap is of less importance. Vertical surfaces, such as the ends of monitors and sawtooth skylights, are generally covered with metal or with prepared roofing or shingles.

To eliminate the difficulties attending the loss of heat through roofs, with particular concern for minimizing condensation on the inner (and in some cases, upper) surface of roofs, it is occasionally necessary to interpose a layer of insulating material between the structural roof and the outer surfacing material. Several substances are prepared for this purpose, cork being very commonly utilized. Fibrous mattings or compressed boards are efficient in varying degree. If extreme conditions are being contended with, drip gutters must be placed beneath windows, under beams, and at all places where experience shows drops of water will collect. To avoid condensation on windows it is necessary to use double-glazed sash.

The prevention of leakage is simply a matter of using appropriate materials in a workmanlike manner. A leaky roof, in fact, is more frequently to be blamed on the architect for lax specifications and wrong choice of material or method, or upon the owner for parsimonious economy in first cost, than upon the roofing contractor. Sawtooth roofs are generally considered by laymen to be always leaking, due largely to this lack of good roof construction. A sawtooth roof, with its many valleys, may be as tight as any other roof. It is simply a matter of good flashings and of extra layers of felt and asphalt in the valleys to take the wear of persons walking along them to wash windows.

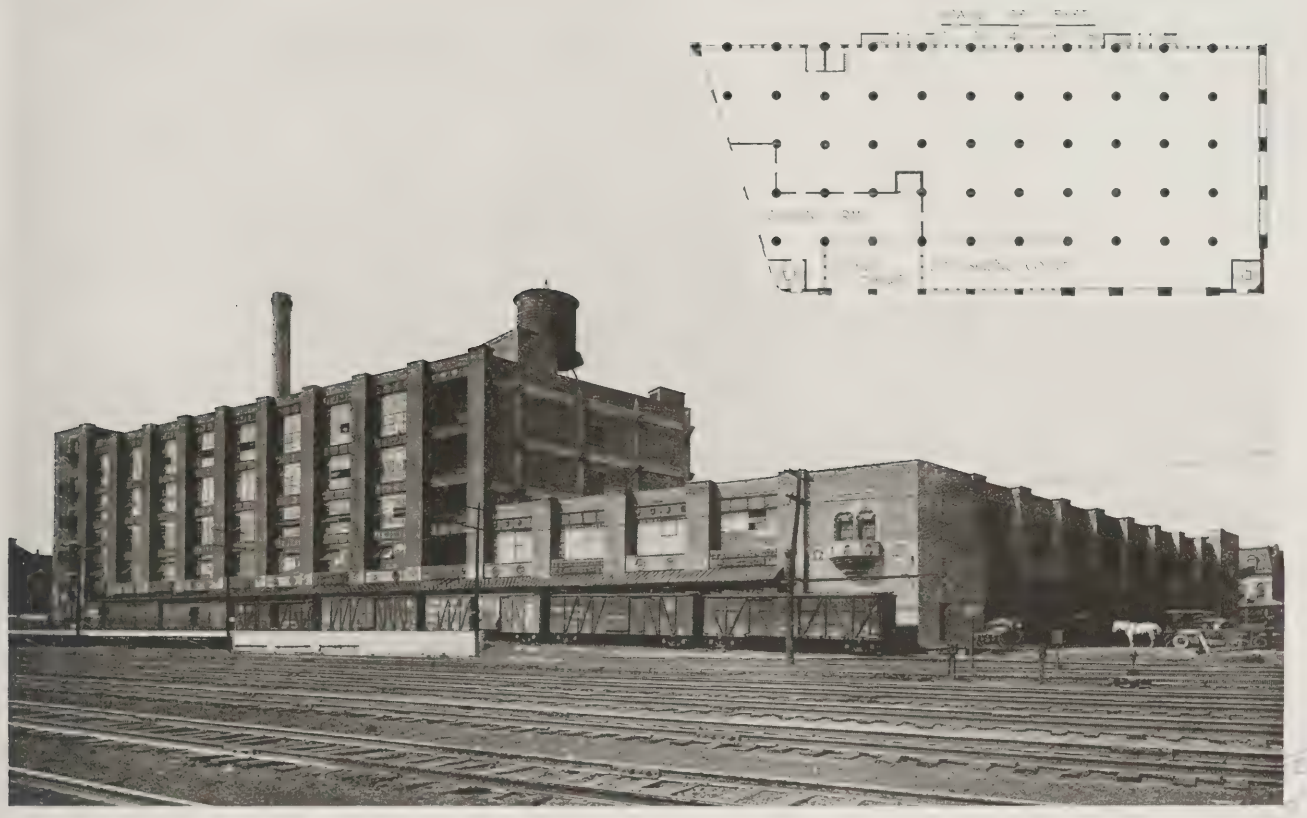
The final point in a satisfactory roof is the flashing at all interruptions in the plane of the roof. These points should be observed: First, the flashing should be of a permanent and non-corrosive material. Second, it should be set in a flexible manner, particularly with wood plank roofs so that the shrinkage of the wood will not tear the flashing. Third, flashings should be carried above the highest point to which water can collect before overflowing its barriers in case the drains are choked or are of insufficient capacity. This means that the flashings should extend at least as high as the "crown" of a flat roof, and preferably to the level of some emergency overflow, such as a series of "weep holes" extending through the parapet walls.

GENERAL EXTERIOR VIEW AND FIRST FLOOR PLAN

Exterior walls of light brown, rough-textured brick with panels of glazed tile. Large publishing room with area of 40,000 square feet has sawtooth roof of "super-span" construction requiring only three columns for the entire area. The office portion is of mill construction

PRINTING PLANT OF THE CHILTON CO., PHILADELPHIA

THE BALLINGER COMPANY, ARCHITECTS AND ENGINEERS



GENERAL VIEW FROM RAILROAD, AND PLAN OF TWO-STORY SECTION

DETAIL OF FIVE-STORY SECTION

R. R. DONNELLEY & SONS CO. PRINTING PLANT, CHICAGO

HOWARD SHAW, ARCHITECT

PERSPECTIVE VIEW OF COMPLETED MAIN BUILDING

This building for the Lakeside Press is of flat-slab reinforced concrete construction, the floors being designed for a live load of 300 pounds and columns spaced 25 feet on centers each way to accommodate large printing presses. Dark red brick and Indiana limestone are used for the exterior. Interior walls are of plaster, and ceilings are of concrete, painted; no wood trim is used. The floors are of concrete.

DETAIL OF LOWER STORIES OF MAIN BUILDING

R. R. DONNELLEY & SONS CO. PRINTING PLANT, CHICAGO
HOWARD SHAW, ARCHITECT

DETAIL OF ENTRANCE

ENTRANCE LOBBY

GENERAL EXTERIOR VIEW

COLUMBIAN COLORTYPE CO. BUILDING, CHICAGO

ALFRED S. ALSCHULER, ARCHITECT

COLUMBIAN COLORTYPE CO. BUILDING, CHICAGO

Illustrations on Plate 41

Type of construction: Reinforced concrete. First floor on filled ground; 2nd, 3rd and 4th floors designed for live loads of 250 pounds; 5th and 6th floors 150 pounds per square foot.

Exterior materials: Rough textured brick with terra cotta trimming.

Interior materials: Plaster walls; wood trim.

Floors: For working spaces, finished with cement and treated with a floor hardener; for toilet rooms, composition; in other places, terrazzo.

Windows: Steel sash; large skylight in photograph gallery.

Lighting: Steel enameled reflectors over presses, composing tables, type racks, etc.; general illumination elsewhere. Many special provisions in art room and photograph department.

Heating: Direct vacuum steam radiation; electric vacuum pump to care for returns. Building heated by four cast iron sectional low pressure boilers.

Date of general contract: April, 1920.

Total cost of building: $497,500.

Cubic foot cost: 28 cents.

FIRST FLOOR PLAN

SECOND FLOOR PLAN

DETAIL OF ENTRANCE TOWER

VIEW OF PLANT FROM APPROACH

TYPICAL INTERIOR VIEW

MANUFACTURING BUILDING, WHITIN MACHINE WORKS, WHITINSVILLE, MASS.

J. D. LELAND & COMPANY, ARCHITECTS

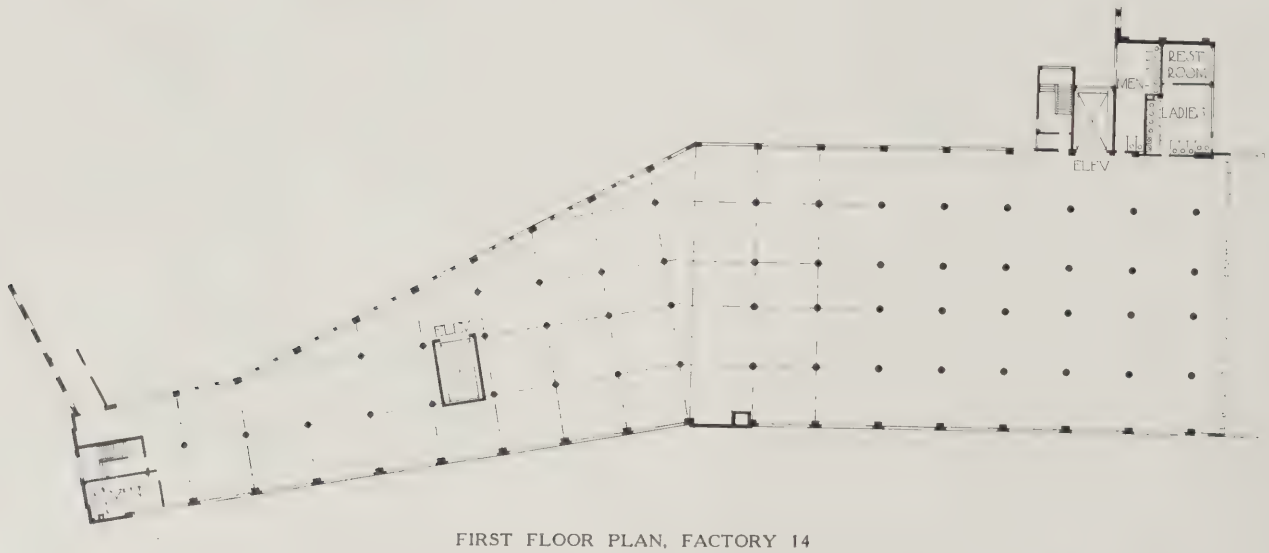
BUILDINGS FOR WHITIN MACHINE WORKS, WHITINSVILLE, MASS.

Illustrations on Plates 42-44

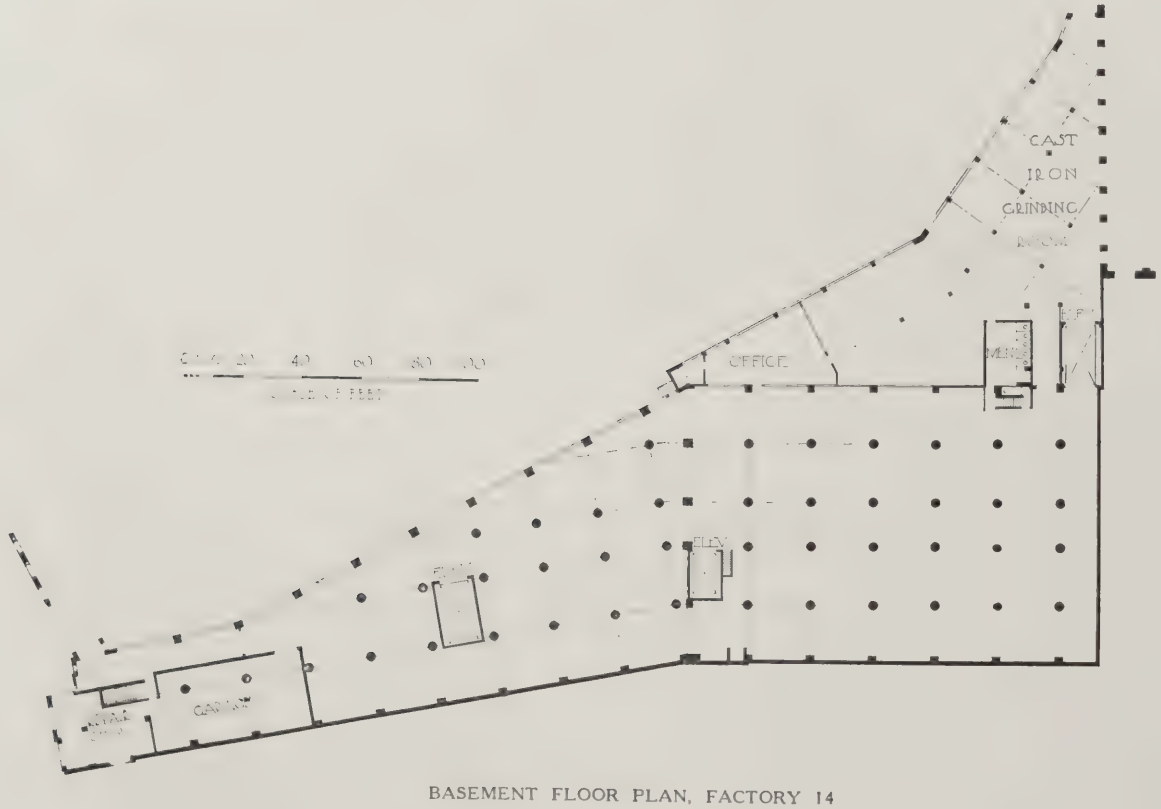
Factory 14: Reinforced concrete construction, mushroom type with brick veneer. Basement, first and mezzanine floors are designed for live loads of 550 pounds; other floors, 250 pounds. The windows are counter balanced, steel type. The stairways are reinforced concrete.

Administration building: Reinforced concrete construction with brick veneer, interior finish in ash, and the finished floors are linoleum. The stairways are iron and slate, and the exterior balconies of ornamental wrought iron; the windows are wood. The building is equipped with mechanical ventilation.

Garage: Reinforced concrete construction with concrete stairs; exterior of brick veneer; counter balanced steel sash. All buildings are equipped with electric elevators.

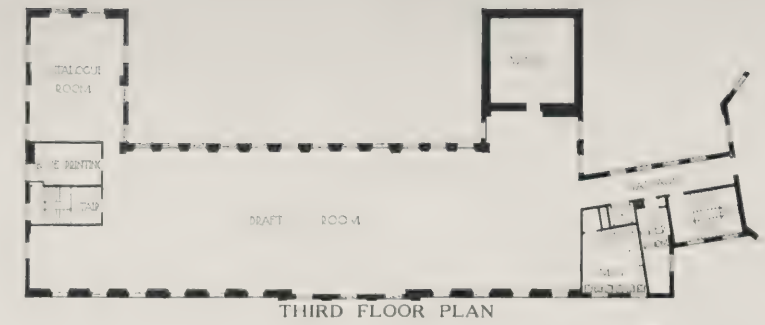


FIRST FLOOR PLAN, FACTORY 14

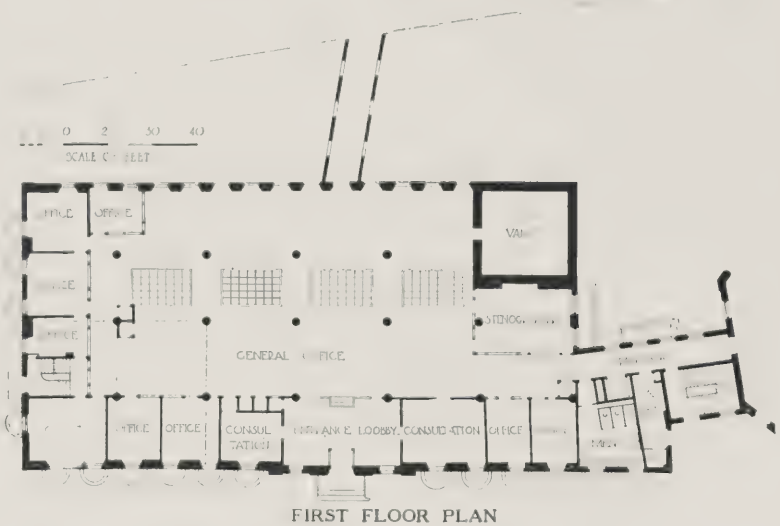


BASEMENT FLOOR PLAN, FACTORY 14

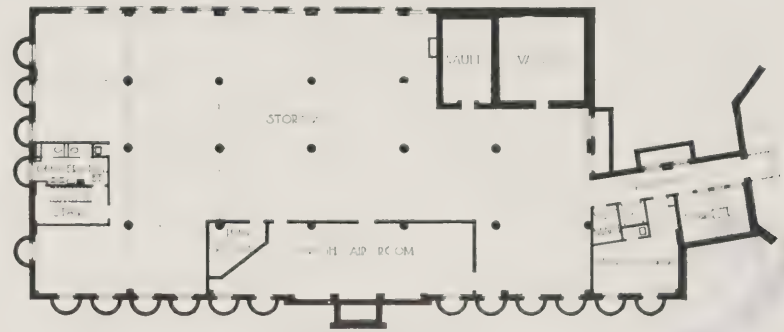
GENERAL VIEW FROM APPROACH



THIRD FLOOR PLAN



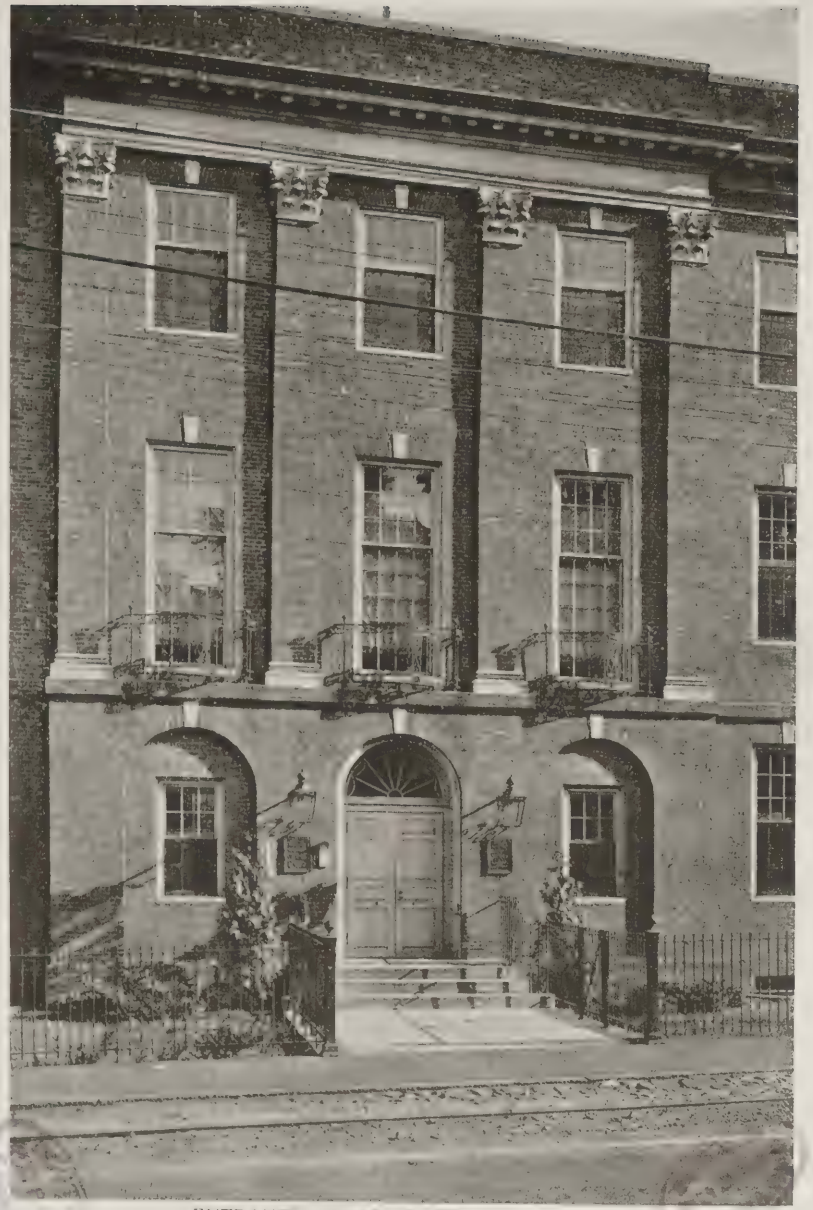
FIRST FLOOR PLAN



BASEMENT FLOOR PLAN

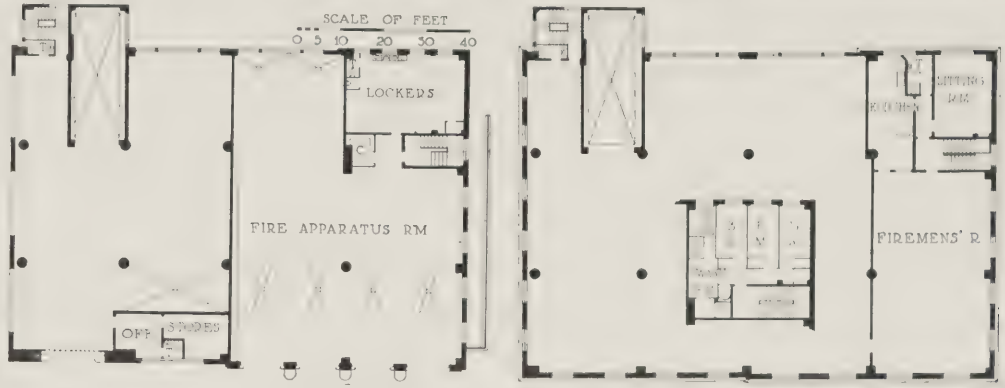
ADMINISTRATION BUILDING, WHITIN MACHINE WORKS, WHITINSVILLE, MASS.

J. D. LELAND & COMPANY, ARCHITECTS



ENTRANCE TO ADMINISTRATION BUILDING

GENERAL VIEW OF FIRE HOUSE AND GARAGE



PLANS OF FIRE HOUSE WITH MEZZANINE INSET

BUILDINGS FOR WHITIN MACHINE WORKS, WHITINSVILLE, MASS.

J. D. LELAND & COMPANY, ARCHITECTS

Industrial Flooring Materials

By CHARLES A. WHITTEMORE

Of Blackall, Clapp & Whittemore, Architects, Boston

IN industrial buildings the problem of construction is complex. Foundations must support the buildings without undue settlement. Walls must support the superimposed loads without distortion. Floors must be sufficiently strong to carry the dead and live weights without deflection or vibration, and the surface must not disintegrate. In connection with this last condition the problem presents difficulties which are not easy of solution. There are so many different kinds of floor surfacings on the market that one could confer with a continuous stream of representatives, each with merit to his claim that his material will meet the requirements.

If it were possible to obtain the ideal floor surface it would be wearproof, dustproof, waterproof, and inert. These qualities are all important in industrial buildings, and in many cases the lack of these characteristics will mean losses in the manufacturing process. Wearing down of floors necessitates repairs; dusting ruins machinery; absorption destroys the strength of the floor, and "non-inert" floors by cracking, swelling or shrinking may affect the alignment of machines as well as causing unevenness in the surface. The floor treatment which meets all these conditions will be a wonderful discovery. Boiler plate is in many ways unsatisfactory. Marble wears out; wood rots, etc. It seems as though natural products would not be as satisfactory as manufactured floor materials might be.

In mill construction maple floors present a good wearing surface and have long been considered satisfactory for most places where wood may be used. There are now on the market wood flooring materials treated with preservatives for which much is claimed. There are also wood floorings in block form, some of them so arranged that the wear all comes on the end grain, and this grain arranged so as to vary its direction. Each serves its purpose and specific place, but none may be considered the ideal floor. There is no other natural flooring material which can be generally used. Expense or lack of durability prohibits. The net result of such a decision is that investigations must be conducted in the field of manufactured materials.

The broad divisions of manufactured floorings are cement, composition, and linoleum. Because most industrial buildings nowadays are of fireproof construction, the concrete floor as a base for surfacing is the most common. The concrete with a top surfacing becomes practically inert and is homogeneous, and can be made waterproof, but, on account of the nature of the material, concrete in itself is full of voids which have not the resistance to abrasion of a solid material. To make concrete "wearproof" it seems necessary to fill the voids. This may be accomplished by using as the final surface dressing a mixture of neat cement and fine sand. If such a mixture be well troweled or rolled with heavy rollers a surface will be produced which will resist wear under some conditions.

A surface as just described would be suitable for industrial buildings where the trucking is light. It must be borne in mind, however, that machinery produces vibrations which, while not noticeable to the casual observer, continually react on the floor construction and loosen particles of the cement and sand in the form of a fine, almost impalpable, powder. To make such a surface dustproof can be accomplished only by the use of some agency having the property of binding the particles more closely than the natural cohesion can bind them, or by causing a chemical reaction which will increase the abrasion resistance. There are liquids for surface treatment or integral mixing which are manufactured for this purpose. There are oils which, upon oxidation, fill the voids and bind the microscopic particles into a mass of great density. There are metallic substances which, when mixed with the top surfacing, present the wearing qualities of iron. All these have their adherents.

Experiments have been conducted in the use of terrazzo, so-called. This is a top surfacing of cement, sand and crushed stone or marble, trap rock or other hard wearing surface. The results of these experiments would seem to indicate that this kind of cement floor surface is satisfactory even under trucking conditions. This type of floor has been made up using ceramic chips instead of marble. Such a floor will stand hard abrasion as well as any of the terrazzo type.

In a previous issue of THE FORUM* the subject of granolithic floors was discussed. The general method of laying any cement type of top surfacing is the same as for granolithic. It may be well to call to mind a few of the essential steps:

1st. See that the floor to which the top surface is to be applied is thoroughly roughened and cleaned of all dust and loose particles.

2d. For the best results the floor should be washed with clean water and be in a damp condition before the leveling material is deposited.

3d. Level off to fixed screeds, and see that surface is even and true.

4th. Before this material has become too firmly set, deposit the final surfacing and roll or trowel with steel trowels.

When aggregates of any kind are mixed in the final surfacing they should be laid on the leveling course in an even layer and thoroughly rolled or

*January, 1923.

troweled in. A floor made up of this type should prove to be a very satisfactory investment for the owners of an industrial building where the trucking and service are heavy.

Many of the composition floors have some cement as a base, but the proportion is so small that they cannot be classified as cement floors. Magnesium salts, calcium salts, wood and asbestos fiber, sodium silicates, sawdust and silex all are used in the preparation of composition flooring. In considering a floor of this class one must know that after the chemical action is completed the mass becomes inert, non-absorbent and not affected by climatic changes. It is, therefore, desirable to select a floor with the least vegetable content. Sawdust and wood floors may decay, hence too large a proportion of either of these is detrimental. They are also the cheapest components, and are serviceable principally as "fillers" to make more "body" to the composition. They do, however, act as buffers between the more solid particles, giving resilience to the floor and also imparting a tendency to prevent sound transmission.

Composition floors have a peculiar characteristic in that when struck with a solid substance they sound hard. When walked upon they feel anything but hard. Such flooring material will give good service under ordinary trucking conditions and will be found very comfortable for employes to stand upon. For heavy trucking or for situations where metals or cases are dropped, such a floor would not be ideal unless designed and laid with special care.

The majority of composition floors vary in thickness from ½ inch to 1⅛ inches, and can be laid over wood or concrete. This is a distinct advantage over cement type floors which cannot be used in thickness less than 1¾ to 2 inches. A floor of this type may, therefore, be laid over an old floor of wood or cement without disturbing the old surface. This necessitates at times changes in doors, etc., but in no case is the extent or expense of such a procedure comparable with what would be required if a cement type floor were to be used.

The "mastic" floors are composition floors, but of a different type from those previously described. Asphalt, asbestos, cork, wood flour, and other materials enter into the makeup of the floors. Marble chips, quartz, etc., are used where the floor must resist abrasion. These floors are laid in a variety of ways: some under heat, some in successive "building up" layers, and some in a plastic mass. The "mastic" type floors are never supposed to harden to the consistency of a hard cement. Part of their value lies in the resilience of the medium itself. Dents automatically iron themselves out and real damage, such as cracks or badly worn places, may easily be repaired. This type of floor is used in warehouses, on shipping platforms, in factories, etc., and is impervious to moisture.

One point in the construction of industrial buildings always gives trouble, and that is the proper and adequate arrangement of hangers and supports for pipes, shafting, etc. This is a real problem and reduces itself only with difficulty to a common rule for all buildings. The engineer must know all the requirements for the building and should have all contracts under his control in order to provide support for all future demands as the construction proceeds. It is simple enough to lay out hangers for steam, water, gas, electric, sprinkler pipes, and also for shafting, etc., if these are all decided upon sufficiently in advance. The real difficulty lies in anticipating future needs as developed by changes in machinery, etc., as well as by the increased business or manufacturing demands. There are various types of hangers which may be used in connection with concrete floors for pipe supports. Obviously, the best is the hanger which permits of adjustment of the point of support. Such a hanger will enable the builder to change locations of pipe lines without tearing up concrete. All these types are arranged to be set in on the forms, and some are equipped with integral reinforcing rods to allow for extra heavy loads and more even distribution. Some are arranged to be attached to the reinforcing rods. Use of any type which is easily set in place, which is securely held in the construction, and which allows adjustment of support spacing is a distinct asset to the building.

A discussion of floor construction is not complete without considering the stair and platform treatments. Here is great wear. In the average industrial building the employes use the stairs more than the elevators, unless the building is more than four stories. Hence twice, and generally four times, per day the stairs are called upon to withstand the wear incident to the passing of a number of people. On the treads, therefore, must be a wear-resisting, durable, non-absorptive, non-slip material. Terrazzo, ceramic, cement, composition as well as slate, marble and steel all are used for the tread surfaces.

There are, of course, the standard safety treads composed of a metal base grooved with non-slip material filled in the grooves, and also metal with steel filings or carborundum fused in the wearing surfaces, also other variations on the basic principles of these two types. Where marble, slate or metal is used as the tread, a safety edge should be provided and *set in place*. Where the plastic materials are used, these treads may be cast with carborundum or steel filings, mixed in the top surfacing or troweled in the surface as the "set" begins to take place.

Floors like facts are stubborn things. Once in place they are not easily moved. When we consider the floor, not as the walking surface alone, but as the support for machinery above and possibly below; when we realize the pipes, conduits, hangers, inserts, shafting and all the equipment units which the floor must contain or hold in place, we cannot but feel that however much care, study and thought we give to the selection and arrangement of materials, a satisfactory floor, standing up to its demands, is a well worth while reward.

Natural Lighting of Industrial Buildings

By WILLIAM R. FOGG

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THE natural lighting of industrial buildings will doubtless continue to be of considerable interest and importance to designers and owners in spite of the recent discovery that under many circumstances it costs as much to arrange for natural light as for artificial illumination. Sometimes it may cost more to provide for lost heat, for overhead charges and the like than for the current, maintenance and overhead of an adequate electric lighting system.[1]

The force of custom, the more pleasant working conditions of natural light (at least most people seem to prefer it), the opportunity for relieving eye strain by looking out of windows for long distances, and other such considerations will doubtless have greater influence on factory design than whatever slight economy may be possible by the exclusive use of artificial light. The discovery, nevertheless, is of immense value, particularly because of its effect on the design of buildings in congested areas where heretofore it has been considered necessary to provide large light wells in areas of high land value. This discovery will also be of value to industries manufacturing a product likely to be injured by sunlight or strong daylight.

The outstanding characteristic of natural light is its variable nature, not only in quantity from day to day and hour to hour, but also in its quality. In this respect artificial illuminants are far more easily controlled. It is known that on cloudy days the "sky light" is much brighter than is the blue sky of a clear day. For instance, Messrs. Perrot and Vogan,[2] in measuring the foot candle intensity of natural light in a 98-foot building with windows in the east and west walls, found these facts: At nearly noon (10:50 and 11 a.m.) on a cloudy day they measured a light intensity of 124 foot candles 4 feet in from the west wall, and on a bright, sunny day with clear sky only 20 foot candles in the same position. The dull gray clouds actually cast into the building over six times as much light as the blue sky reflected. At the east wall on the cloudy day they measured 120 foot candles intensity (6 feet from the glass), and on the sunny day 428 foot candles intensity. Thus on dull days both sides of a building (east and west) receive almost exactly the same amount of light, whereas on a sunny day the wall in shadow is deficient in light, while the wall in sunshine has an excessive intensity of illumination.

[1]See "The Cost of Daylight," by M. Luckiesh and L. L. Holladay of the Laboratory of Applied Science, Nela Research Laboratories, National Lamp Works of the General Electric Co., Cleveland. *Transactions of the Illuminating Engineering Society*, February, 1923.

[2]"Some Practical Daylight Measurements in Modern Factory Buildings," by Emile G. Perrot and Frank C. Vogan. *Transactions of the Illuminating Engineering Society*, August, 1919.

The curve showing the intensity of illumination at intervals across a building roughly corresponds in shape to a broad based U. The vertical sides of the U represent the intensity at the windows, and are about equal on cloudy days and very unequal on clear days. The broad base represents the much lower intensities found in the center of the building. The area of low intensity varies approximately with the width of the building. In the wide building just referred to the average intensity of illumination for the center third of the building was approximately $^{65}/_{100}$ foot candles on the cloudy day and 2 foot candles on the sunny day. Note that the bright sunlight in the east windows tripled the amount of light at the center as compared with a cloudy day. This data, if thoroughly analyzed, will be found to embrace the essential problem of the natural lighting of buildings. The high intensity at the windows must be carried to the center to the greatest possible degree, and yet the intense glare of the direct sunlight must be subdued.

Modern practice has attacked this problem in several ways,—by increasing the ratio of window area to floor area, by improvements in the character of the glass, by the use of interior wall and ceiling finishes of high reflecting power, and by the use of sawtooth construction where practicable.

Naturally, the design of a building is the greatest single factor determining the quantity of its natural light. Exterior objects, like other buildings in close proximity, may have a very serious and uncontrollable effect in special cases, but given a free-standing building, the amount of light depends very largely on the size and placing of the windows and upon the width of the building. When the shape of the land requires wide structures it is common practice to use light wells in the interior, or to divide the building into two or more sections separated by courts. So many factors govern the sizes, shapes and proportionate areas of these courts that space will not permit of an adequate treatment of them here. In general it is desirable to keep the width of a multistory building from 60 to 100 feet, so that no point will be more than from 30 to 50 feet from windows. It is obvious of course that the ratio of glass to floor area may be increased either by using narrow buildings or by increasing the story heights (and the window heights). These methods, while entirely practical under certain circumstances, generally involve considerable increases in first cost and maintenance that can be avoided by other methods. When the layout of machinery or other dominant factors require wider buildings, reliance must be placed entirely on window area, special glass and suitable reflecting surfaces for adequate center light.

Within the last three decades the change in the fenestration of industrial buildings has been very marked. Around 1890-1900 the typical factory was lighted by double-hung wood sash windows often occupying less than 50 per cent of the available wall area. Since then the ratio of window area to wall surface has vastly increased, until it has become common practice to make 85 per cent of the available wall area of glass. By available wall area we mean the area between the top of the spandrel or curtain wall (at bench height above the floor) and the ceiling, for this is the only area in which windows can be placed effectively.

A recent improvement in concrete construction has made it possible to get practically 100 per cent of the available wall area in glass. By constructing the floor as a cantilever beyond the last row of columns and supporting the wall and windows on the edge of the projected floor slab, exterior piers may be entirely eliminated, so that continuous rows of sash may extend from end to end of the building, interrupted only by stair towers or corner pilasters applied for architectural effect. This type of building is illustrated on page 119. By means of this construction very wide buildings can be provided when needed with satisfactory interior light. It should be noted that the round columns obstruct less light than rectangular wall piers, and also that this construction is less costly than the types generally used.

Overhead lighting of factory interiors is possible on the upper floors of multi-story buildings or in one-story structures by means of skylights, monitors, or sawtooth construction. In the article on Roof Types and Roof Surfaces in this issue (page 109) sufficient mention is made of the advantages and uses of each type to indicate their relative merits. The building providing the nearest ideal light is that with a sawtooth roof. The orientation and shape of the skylights prevent sun glare, for only north sky light is admitted. In ordinary practice the window area is about 33 per cent of the floor area exclusive of wall windows. It is important to note that for a given ratio of glass in the skylights to the floor area, greater interior illumination results from using a smaller number of large size sawtooth skylights than from using more sawtooth skylights of smaller sizes. This tends to save in the cost of construction. The usual maximum width of a sawtooth skylight is 25 feet with glass about 8 feet in height.

Since sawtooth skylights depend for their illuminating value upon sky light, as distinguished from sunlight, or in other words, upon reflected light instead of direct light, it is well to remember that a blue sky gives much less intensity of illumination than a cloudy or even a dull gray sky. If the upper surfaces of adjacent skylights were colored a dull black, so that they would absorb the direct sunlight, it would be found that the interior of a sawtooth building would be darker on a clear day than on a cloudy day. By using a bright surface, such as light colored gravel or some form of prepared asbestos which is nearly white on the roof surfaces, the direct rays of the sun on a clear day are reflected into the skylights with a consequent increase in the interior illumination.

Next in importance to the structural design of a building are the size and position of the windows and the kind of glass used. As regards the actual intensity of illumination of a building it matters little what type of window sash is employed to frame a given area of glass. The choice of sash is governed not so much by questions of lighting as by the factors of cost, ventilation, durability, appearance, and method of cleaning. When a given wall opening is required to admit the maximum of daylight, the thickness of the window frames, meeting rails, muntins, and other opaque parts may govern the choice of type. Windows should be placed as near the ceiling as is possible, not only for maximum light but for ventilation, when it is required. They need not extend below the general working plane of the room, for the light admitted below this point is of practically no value, and the wall space is generally needed for radiators or benches. Since much heat is lost through window glass, a saving is effected by stopping the glass at the working plane. To make best use of the window light the placing of machinery should be carefully considered, lest the process require that the operatives constantly work in their own shadows.

Of the many different types of windows on the market, a few are more commonly used than others. "Factory sash," or rolled steel sash, is used for large openings and offers little obstruction to the light. It comes in a variety of standard sizes, with sections pivoted or projected in various parts for ventilation. If thorough ventilation is desired, the upper openings should be at the extreme top, and the lower openings at or near the lower edge. Center openings only are of little value. When air conditioning is essential it is often better to rely entirely on the air conditioning apparatus for ventilation, using fixed sash without movable sections.

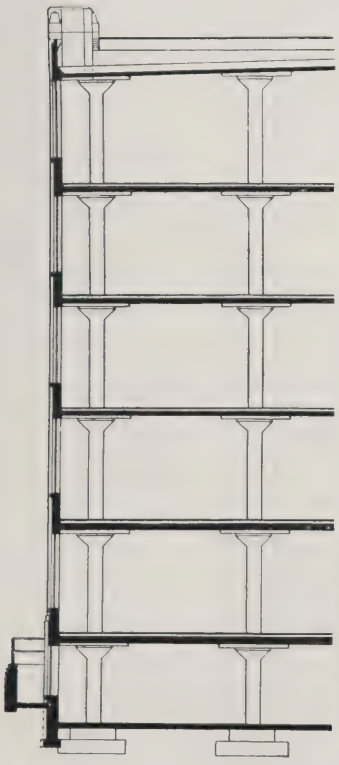
The use of sliding sash is generally limited to smaller wall openings, since the grouping of sliding sash frames requires mullions of appreciable thickness. Vertical sliding sash may have two sections, each independently counterbalanced with weights or springs, or they may be balanced one by the other, so that lifting the lower sash lowers the upper. Then there are several types combining a sliding and a projected or pivoted motion, operated by simple systems of levers, so that openings occur simultaneously at the top, bottom and center of the window, and the glass rests at an angle with the frame in a manner to prevent the rain from driving into the room. Rolled steel is used for low cost work and bent steel shapes or bronze for the higher grade windows required in office buildings and hotels.

Continuous steel sash having ventilating sections often require mechanical devices to open and close them, particularly in monitors, sawtooth skylights, and other inaccessible places. For the shorter runs the torsion system is largely used; it employs a worm and sector, with arms fixed to the torsion shaft operating each ventilating unit in the series. For longer runs a combination of levers operated by rods that are pushed or pulled by the operator is employed. Sash opening devices may be manually or electrically operated. Reference to accompanying illustrations will show several of these installations.

Interior of James Lees & Sons Co. Factory, Bridgeport, Pa., showing excellent light obtained from continuous sash; building 121 feet wide

Window glass requires cleaning at regular intervals to maintain its efficiency. Three common methods are used, depending on the kind and size of the windows. Pivoted sash may often be cleaned entirely from within the building. Sliding sash, and other types having openings of sufficient size for a man to get through to the outside, are generally cleaned by workmen standing on the outer sill. Bolts for safety belts must be installed when this method is employed. Large areas of fixed sash are generally cleaned two or more times a year by means of painters' scaffolds suspended from the roof, or in low buildings by the use of a hose from the ground.

The kind of glass used in the windows has much to do with the amount of light which gets into the building. A clear or transparent glass transmits direct light most efficiently, but under many circumstances some forms of glass that are translucent but not transparent are preferred. Where transparency is desired, ordinary window glass of single or double thickness, or polished plate wire glass, constitutes the range of choice. Even if other forms of diffusing glass are used in the greater part of a window, it is well to have clear glass of some sort up to and perhaps a foot or so above eye level. Manufacturers have found in many cases that workers are more contented when they can see beyond the walls, and also that they seem to feel



Section through cantilever bay and exterior showing resultant continuous sash
James Lees & Sons Co. Factory, Bridgeport, Pa.
The Ballinger Company, Architects and Engineers

less eye strain from their work when a distant view may be obtained at will. It is imperative to use clear glass at the eye level when rippled or prism glass is used, for the glare of these types is most discomfiting when directly in the line of vision.

When wire glass is required, either for fire protection or to avoid the danger of shattered glass, it is generally necessary to accept a translucent glass, for the only transparent wire glass is polished plate wire glass, which costs much more than the ordinary "rough" wire glass. This is no hardship, however, for the rough glass tends to diffuse the light in a very important manner. Most of the light entering a window falls at an angle, penetrating to only a relatively short distance. Much of this light is absorbed by the floor, machinery and other dark objects at the working plane or below. To carry the light as far as possible toward the center of the building it is desirable to bend these oblique rays toward the horizontal, or else to have them strike a good reflecting surface such as a white ceiling from whence they will tend to spread toward the interior. Rough glass breaks up the direct light beams, diffusing them in all directions, so that some are thrown horizontally, some bend upward to the ceiling, and some of course are bent downward to the floor and are wasted. Enough light is diffused in the desired directions to make the use of a rough glass more efficient than that of a clear, plain glass for lighting the interiors of wide buildings. A more efficient method of bending the light rays is by the use of glass having prisms so cast upon its face as to correctly divert most of the rays to a horizontal plane. Prism glass is highly successful for this purpose, but its cost is generally prohibitive for large operations. Ribbed glass, having horizontal

Rolled Steel Factory Sash with Ventilating Sections

semi-circular ribs of small radius rolled into one face, is practically as efficient as prism glass and performs the same function at much less cost. Although theory requires that the ribs be placed horizontally, it is common practice to set them vertically as they then collect less dust. Other translucent glasses, such as "milky," "frosted," "ground," "flowered," and the like are low in efficiency and are used only for decorative or other special uses.

Wire glass comes in large corrugated sheets which are very useful for skylights, marquises, and even for whole roofs or buildings. It may be employed with corrugated metal or asbestos sheets in a roof, forming a very simple and effective skylight. In the opinion of many engineers, corrugated glass is more efficient in sawtooth skylights than is flat glass because of its diffusive power.

Concrete Saw-tooth Construction with Fixed Sash
Tiffin Building, Long Island City, N. Y.
The Ballinger Company, Architects and Engineers

Glass is also pressed in forms to match roofing tile with which it may be used to form small skylights that are hardly visible from the ground. There are cement tiles having glass lights embedded in the centers and other special ways of using glass for the admission of light. An interesting special type of glass is one that is "non-actinic," which will not pass the ultra-violet and infra-red rays which are harmful to some dyes, rubber and other materials. This glass has a slightly yellowish tint. Experiments have been carried on looking toward the discovery of glass that is a non-conductor of heat and heat rays, but no progress seems to have been made.

All glass is a good conduc-

tor of heat, hence much heat is lost in cold weather through the glass. When the air in a building contains a high percentage of moisture, the conductivity of glass causes condensation of this moisture whenever the outside temperature drops to the dew point of the enclosed air. The drops of water or steam collecting on the windows not only may drip on goods in process of manufacture and thus injure or spoil them, but also cut down the translucency of the glass to a certain extent. To avoid these conditions it is sometimes necessary to use double glazed windows in which two panes of glass are used in each section of the sash, the panes being separated by a dead air space which is a non-conductor of heat.

The last factor of primary importance in seeking good interior illumination is the manner of finishing the interior surfaces of the building, particularly the walls, ceilings and columns. As we have indicated, the strong intensity of illumination near the windows must be relied upon to give satisfactory lighting at the center. A very great difference in the center light may be observed by using various materials for the wall and ceiling finishes. White is the best color by far, and though there is a difference of opinion between the value of a matt surface or a gloss surface, the latter seems to be the more practical as it can be washed or wiped clean and the brightness renewed periodically.

Direct sunlight is of such great intensity that it is often necessary to provide sun shades to reduce the glare. At best this is a bad matter, and when one seeks to find a wholly satisfactory type of window shade, the choice is exceedingly limited. Ordinary whitewash is sometimes used on the glass for a cheap makeshift, but it cannot be removed for cloudy weather or late afternoons. White cloth curtains of cotton duck or lighter material are employed, but they blow about in the wind and are not easily drawn back when the sun glare ceases. Various types of roll shades similar to those used in residences are made, and they may be applied directly to movable sections so that they will not obstruct open windows. Various modifications of the Venetian blind are also available, and these when correctly installed seem to be reasonably efficient. A good curtain installation should be easily controlled in sections, so that either the upper or lower part of the window may be shaded; it should not obstruct ventilation or prevent the opening of windows. Flapping curtains constitute a fire and accident hazard that should never be tolerated, and they are a source of annoyance to the workers. A fortune awaits the inventor of a means of eliminating sun glare and sun heat without restricting the intensity of illumination at the center of a building.

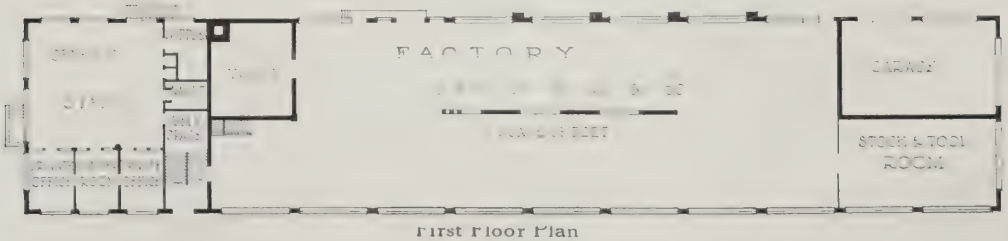
Good natural lighting in any building is largely a matter of maintenance once the structure has been erected. Glass accumulates dirt with surprising rapidity, and its translucency is much diminished thereby. Windows should be washed periodically, the interval depending partly upon the situation of the building, and partly upon the importance attached to maximum illumination.

Baking Room, General Baking Co. Plant, Bronx, New York
Simple monitor roof supported by steel beams. Note appliance for opening sash
The Ballinger Company, Architects and Engineers

Chicago Solder Company Factory, Chicago

RICHARD E. SCHMIDT, GARDEN & MARTIN, ARCHITECTS

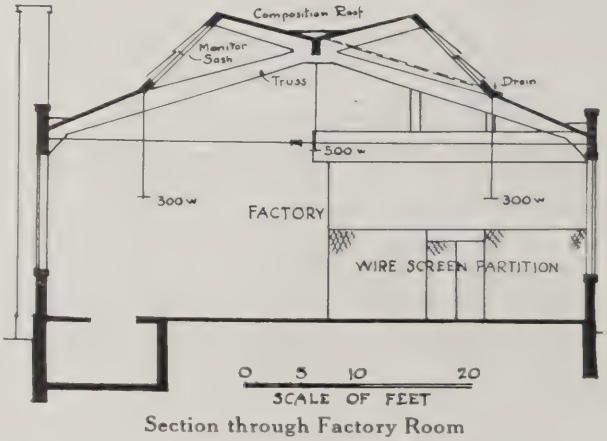
GENERAL EXTERIOR VIEW



First Floor Plan

Second Floor

THE interesting feature of this building is the single-story foundry with large monitor roof. It is supported by a modified scissors type of concrete truss, which in its essential features is patented by the architects. This type of truss has been used by them in spans up to 125 feet. The truss members and roof are monolithically poured concrete. The monitor with continuous steel sash on both sides is formed by cantilever beams extending from the roof. The roof of the monitor consists of a 3-inch slab extended from girders at the end of each cantilever beam and formed on the curve of a catenary to avoid dead load extending stresses. Tie rods are used as the bottom chord for trusses and between ends of cantilever beams at monitor.



Section through Factory Room

Welfare Provisions for Industrial Plants

By CHARLES L. CLOSE
Manager, Bureau of Safety, Sanitation and Welfare, U. S. Steel Corporation

WELFARE provisions in industrial plants can best be summed up by reviewing the activities which have proved practical by experience in a large industrial concern. Over $112,000,000 have been spent by the United States Steel Corporation since January 1, 1912 to improve the working and living conditions of its employes. This welfare work has been carefully organized and is conducted through the medium of a central department located at the corporation's offices in New York, and various standing committees, composed of representatives of the larger subsidiary companies. In addition to the corporation committees covering this field of activity, similar committees have been established in each of the subsidiary companies, at the plants and in the departments of the plants, reaching down to the rank and file of the workmen.

Flowers and Ivy at the Lorain Steel Company

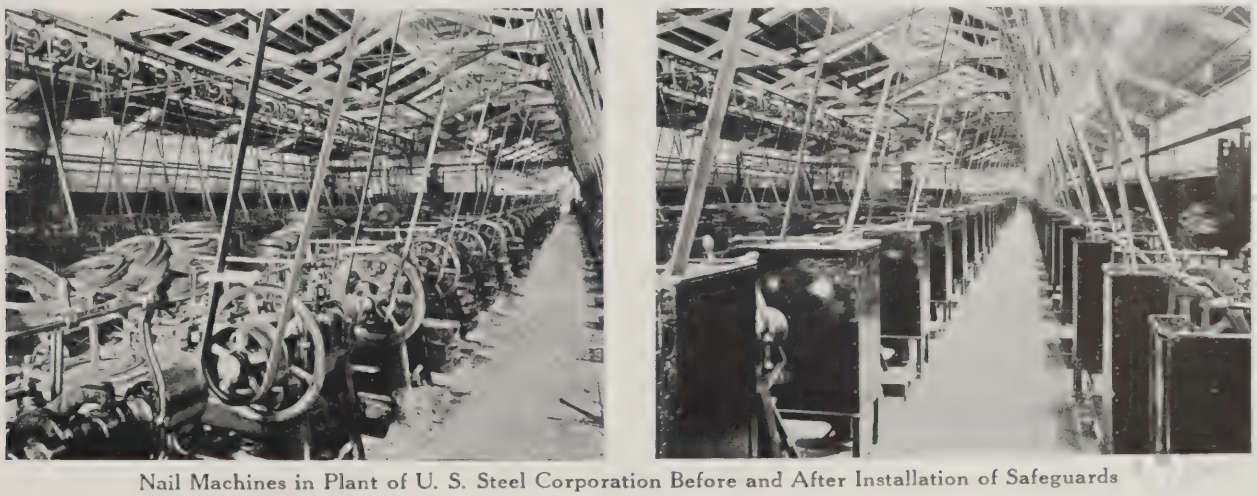
Employment.—Careful attention is given by the employment departments to the placement of new employes in the jobs for which they are best suited and physically fitted. Medical examination of employes has been established by the majority of the subsidiary companies. These examinations have proved very beneficial both to the employes and the companies. They serve as a guide to the plant officials in placing men in occupations which they are physically capable of performing and frequently bring to the timely attention of the men physical defects, often slight and easily corrected, which might, if neglected, develop into more serious ailments.

Accident Prevention.—The activities of the United States Steel Corporation in this respect have been governed by two prime factors,—engineering revision and education. About $12,000,000 have been expended in improving the general physical status of the plants and operations, and constructive effort has been made to educate the workmen in safety matters.

First Aid and Rescue.—Everything possible is done to safeguard employes from accident, but adequate provision is made for relief in case of injury. First aid and rescue crews have been organized in all of the mining companies and in many of the manufacturing companies. The primary object of first aid and rescue crews is to have available specially trained men who can take immediate charge of the situation whenever an emergency arises whereby life is imperiled and can give prompt and skillful attention to injured men.

Emergency and Base Hospitals.—As a necessary adjunct to first aid and rescue work 389 completely equipped emergency stations are maintained in the mines and mills, and 13 base hospitals have been constructed by the subsidiary companies at various locations where public hospitals are not available.

Sanitation.—The corporation has provided proper sanitary facilities at all the plants and mines for the



Nail Machines in Plant of U. S. Steel Corporation Before and After Installation of Safeguards

Drinking Fountain, Structural Steel Works

convenience and comfort of the employes, and much care and study have been given to the matter of safeguarding the health of the employes and their families. By the adoption of the most approved modern sanitary methods and practices physical conditions in the plants and dwelling communities have been raised to a very high standard, and the percentage of occupational diseases and ordinary illnesses among the workers and their families has been greatly reduced.

Careful attention is given to drinking water supply, and all sources are analyzed periodically to determine their purity and palatableness. The most modern sanitary methods are employed in the cooling and distribution of water, and the common drinking cup has been practically eliminated through the installation of sanitary drinking fountains.

Plant Restaurants.—Restaurants have been installed in the plants of many of the subsidiary companies, where employes may obtain wholesome and attractive meals at moderate cost. These restaurants have proved very beneficial, especially to the single men living in lodging houses, and they have also lightened the labor of the housewife by relieving her of the burden of preparing the daily dinner bucket. The food served is of the best quality, and every endeavor is made to furnish properly balanced meals to meet the requirements of the men engaged in steel mill operations.

Clubs.—The club houses provided by many of the subsidiary companies for the use of their employes and members of their families and friends contribute much to the educational and social life of the community. These club houses are attractively planned and equipped and possess the characteristics of the most modern club buildings, including dormitories, libraries and reading rooms, gymnasiums and swimming pools, auditoriums and motion picture halls, dance halls, billiard and pool rooms, bowling alleys and many special features. The libraries and reading rooms are supplied with good fiction and works of educational value, current magazines, periodicals and daily papers, and the members are encouraged in the use of all the facilities of the libraries. The expenses of building maintenance, taxes, insurance and heat are usually paid by the companies, but the clubs are operated in the same manner as other similar organizations, the members, choosing their own officers and conducting all financial and social affairs. Initiation fees and dues are well within the means of all employes.

Rear Gardens in Housing Development
Morgan Park, Duluth, Minn.

Hospital Ward, Tennessee Coal and Iron Company, Fairfield, Ala.

Good Fellowship Clubs have been organized by the employes in many of the plants. The management of these clubs is entirely in the hands of the members, who choose their officers and directors and

conduct all affairs of the clubs. They render assistance in cases of sickness and other kinds of distress among their members, as well as financial assistance when necessary. They are not, however, benefit associations in the usual sense, from which members receive certain specified benefits. They also conduct other affairs incident to the social life of the community.

Gardens.—With a view to promoting thrift and improving living conditions, the employes of the

Street View, Morgan Park, Duluth, Minn.

corporation for many years have been encouraged to cultivate vegetable and flower gardens. In many places unoccupied land adjacent to the plant is utilized for community vegetable gardens, and the children of the workmen are taught practical gardening in plots provided for the purpose near the schools. The expense of plowing and plotting the ground is borne by the company, and assistance is given in the purchase of seeds, plants, garden tools and fertilizers. To stimulate a friendly rivalry, prizes are offered for the most attractive gardens. The value of these gardens in the development of higher standards of living is incalculable, and the yield from the vegetable gardens expressed in terms of money amounts to many hundreds of thousands of dollars annually.

Cleanliness, order and pleasant surroundings while at work have a decided influence upon the workmen. To anyone familiar with steel mill operations, it would seem impossible to accomplish what has actually been done in this direction at most of the plants. The outsider probably cannot conceive that anything green, much less anything that blooms, could grow inside of a steel mill yard, yet many attractive flower gardens are maintained, even to those growing in the window boxes

Employes' School, Gary Works, Gary, Ind.

on some of the buildings. This not only makes the plant more attractive in appearance, but often it is the means of correcting some unsightly condition.

Visiting Nurses.—Visiting nurses are employed by the subsidiary companies in a large number of districts. The assistance rendered by these nurses is both of professional and practical value. The object of this service is to improve the general health of the employes and their families. The principal duty of the nurses is to give instructions in those things which will enable the employes to better their conditions mentally, physically and materially. The services are free to those who desire to avail themselves of them, but they are not forced upon the employes, and nurses are not permitted to enter any home unless their services are requested.

Practical Housekeeping Centers.—Good housekeeping and well organized domestic activities are recognized as important factors in the creation of

Plant Cafeteria, National Tube Co., Riverside Works

Provision for Recreation and Athletics at Lorain Steel Co. Plant, Johnstown, Pa.

comfortable and pleasant home environment. For the benefit of the wives and children of the employes, particularly the foreign-born, practical housekeeping centers, fully furnished and equipped, have been established by the subsidiary companies at many of the plants and in the mining towns, where special instructors, usually visiting nurses, conduct classes in the preparation and cooking of food, the care and feeding of infants, dressmaking, and many other subjects of importance in the home. These centers have proved of great influence and value in the communities in which they have been placed.

Playgrounds.—The subsidiary companies have provided 175 playgrounds near the plants and mines to insure safe and attractive places of recreation for the children of the community. That the advantages afforded by these pleasure grounds are appreciated is shown by the fact that approximately 25,000 children use them daily during the summer months. Competent instructors are employed by the companies to supervise the grounds and the activities of the children.

Recreation and Athletics.—109 tennis courts and 125 fully equipped athletic fields, with baseball diamonds, running tracks, etc., and amphitheaters for spectators, have been provided by the subsidiary companies in or near the plants or operations for those who enjoy healthful outdoor recreation, and all employes are encouraged to make the fullest possible use of these facilities.

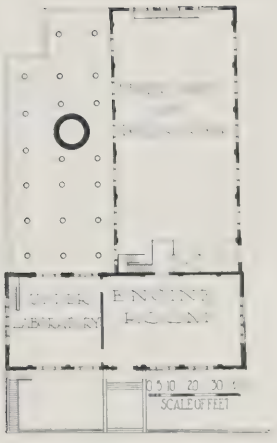
Christmas Festivities.—The Christmas festivities held by the subsidiary companies at their various plants and operations are delightful and memorable occasions for the children. Usually these celebrations are held in the club houses or public halls, but where such facilities are not available, space in one of the mill buildings is provided.

Education and Americanization.—The educational work undertaken by the corporation for the benefit of employes has been attended with much success. The courses are designed to meet the requirements of all grades of employees and cover a broad field of educational activity applicable to the steel industry, from the teaching of elementary subjects in the education and Americanization of the foreign-born worker to the more specialized and highly technical branches required in apprenticeship and vocational training. The instructors are men actively engaged in their respective lines in the mills or in the adjacent communities, and are chosen for their scholarship or their broad practical experience in the subjects which they teach.

Housing.—The problem of providing good housing facilities for employes has long occupied the attention of the corporation and its companies.

Much thought and study have been given to the design and plans of the many houses constructed so that the employes will have homes with modern comforts. The houses are either sold to the employes at cost, or leased to them at low rental rates.

School for Colored Children, Tennessee Coal and Iron Co., Westfield, Ala.



First Floor Plan

THIS building combines boiler room, engine room and power laboratory. It is of steel construction, with brick walls and concrete floors. Coal and ashes are handled by elevator.

POWER BUILDING, GEORGIA SCHOOL OF TECHNOLOGY, ATLANTA
FRANCIS P. SMITH, ARCHITECT

THIS building is for the manufacture of display floats used in the annual parade of the Veiled Prophets in St. Louis. The second floor is for the use of members in dressing. The building has a steel frame with joist floors and steel roof trusses over rear portion. The exterior is of red brick with wood and steel sash, terra cotta trim, wood doors and composition roof. Heating is by direct radiation. The contract was placed in December, 1922, and the total cost was $76,000, or 16.7 cents per cubic foot. Lower floor walls red brick, plastered elsewhere. Ground floor, cement; others maple.

THE VEILED PROPHET "DEN," ST. LOUIS
KLIPSTEIN & RATHMANN, ARCHITECTS

Plumbing for Industrial Buildings

By JAMES A. COTTER

Plumbing Engineer, Boston

USE of plumbing in buildings has gone forward with great strides. All concerned in the design or plan of the building devote much thought to it, and no longer is the provision of plumbing facilities a hit-or-miss proposition. Being a matter which affects the health and well being of the community, the installation of plumbing is regulated by law, and law in most communities is now well defined as to minimum requirements. There is still, however, a great variance in these laws in different sections of the country, which emphasizes the fact that standardization is greatly needed. At the present time, there is being carried on by the Sub-committee on Plumbing of the Department of Commerce Building Code Committee, an exhaustive study in connection with practical experiments for the purpose of making a standard set of plumbing regulations.

The layout of the fixtures involves not only consideration of the initial cost but also the question of location. In the long, narrow type of buildings, the "toilet shaft," which could be placed on the exterior of the building at each end or at the center of long sides, affords an ideal location. By this method there is no valuable floor space sacrificed, and the element of loss of time in gaining access to toilets is reduced to a minimum. For the building whose area conforms more to a square, necessitating an interior light court or shaft, the toilets could be arranged around this shaft.

As for the interior of the toilets, fixtures should not be crowded. Narrow lavatories and urinals, especially when too closely placed, result only in loss of space, because when so installed they cannot be used properly on maximum demand. Like fixtures should be grouped. By so doing the arrangement or sequence of pipes and fittings will be best for economical roughing-in. For example, if men's and women's toilets are adjacent, it would be much better to place the water closets back to back than to have the water closets of one toilet room on one side and lavatories of the other toilet room on the opposite side of the dividing partition. Where a toilet room contains many fixtures it tends to better the arrangement by placing all of one type of fixtures in the center of the room, back to back, and having the other fixtures against the walls. Placing the fixtures adjacent along one wall or partition causes a long run of soil and waste pipes, and the question of pitch in the main becomes a very important factor. This is particularly true of lavatories. On floors of large areas the concentration of lavatories in the main toilet room should be avoided if at all possible, and instead there should be but few lavatories in the main toilet, and the remainder distributed.

The number of fixtures to be installed should be based on the number of people in the building and not, as is very often the case, by installing as many fixtures as a certain amount of floor space will accommodate. Where there are many employes, well distributed over several floors, an approximate rule which may be applied is one water closet for every 15 women, one water closet for every 20 men, and one urinal for every 25 men. When the total number of employes is relatively small, these ratios should be increased to one water closet for every 10 women, one water closet for every 15 men, and one urinal for every 20 men. Lavatories should equal in number the water closets supplied, except where the work done is of heavy nature, in which case facilities should be increased.

The arrangement of fixtures brings up the question of pipe space, of which there is not, generally speaking, enough allowed. It is very well to attempt the concealment of wastes and supplies, but the more this is done the greater should be the working space. The supplying pipes, which may of necessity require many valves and short nipples at the fixtures, are subject to much wear and tear, and these should be readily accessible for repair or removal. If concealed, the need of working pipe space is apparent. The fixtures should be so arranged that no dirt pockets are formed, and the lavatories so spaced that they may be thoroughly cleaned on all exposed sides. The urinals should be so set, if floor outlets are used, that space between, when the fixture is not of the interlocking type, is great enough to allow for proper cleaning. The better practice now is to fill in these urinal spaces and to face up this backing with material to match the walls of the room.

One of the dominant features of a toilet room should be cleanliness. To be maintained, of course, requires constant care on the part of an employe who should wash down at regular intervals the floors, walls and partitions. In order that these parts should not show the effect of careless use of fixtures or of washing, they should be made of hard, non-absorbing materials for about 6 feet above the floor. Above this height plaster with paint serves its purpose well. For floors, of the materials now used, polished cement with cove base appears to meet industrial conditions satisfactorily. White walls greatly emphasize this cleanliness feature, and the more this is developed in the design of the toilet room, the more the users of the facilities will help to maintain it. White glazed tile of large size works out very well. Partitions needed for enclosing water closets only, should rest on post supports, leaving a clearance to the floor permitting proper access to the floor, which aids in maintaining cleanliness.

The fixtures selected for industrial buildings should be substantially made and contain as few mechanical working parts as possible. The water closets should be of best quality porcelain ware of siphon action type, with non-absorbing seats. If it is possible, from a cost point of view, it is better to improve upon this last recommendation by installing a siphon jet closet. In a strictly factory building, the closet should be flushed automatically. Whether the building is of this type or not, the flushing of the closet should be accomplished by means of a flush valve of the oscillating handle type. The urinals should be of the floor outlet type of the larger widths. The flushing of this fixture should be similar to that of the water closets. The long enameled iron sink with supplies over the center, so that both sides may be used simultaneously, is preferred to the individual lavatory whenever the factory is considered. Faucets which permit of use of mixed water through one nozzle used in connection with sinks give good results. Where the building is more of the office type, individual lavatories with two faucets, of either compression or self-closing pattern, should be used. The shower should be supplied for those working in the boiler room, or where the work is of very heavy nature and attended with much dust.

When fixtures of one kind occur in battery, the greatest economy is attained by means of "loop venting." It is possible to have the run so long that intermediate vents will be required. For batteries of two dissimilar types, fixtures are installed to advantage by placing a common vent stack between the batteries and using the loop system on both groups of fixtures.

For soil and waste pipes, cast iron and wrought iron pipe each has its advantages. Although screw pipe is installed much faster than calked pipe, the fluctuating difference in cost of both does not warrant the suggestion as to which is preferable for ordinary toilet room use. For interior conductors which are to be exposed, appearance and space may be improved by the use of screwed pipe. Many kinds of pipe have been used for soil and waste lines where chemicals are encountered. The consensus of expert opinion is that with much acid in the waste the use of extra heavy soil pipe and fittings, thoroughly and heavily coated with asphaltum inside and out, serves the best interest of the building. Whenever installed it should be carried direct to sewer, and while inside the building it should be run exposed. There have been various kinds of especially prepared cast iron pipe for this use, but because of their special qualifications they are expensive, and the initial cost of installing makes their use very limited.

The material for supply pipes, as with soil pipe, should be determined after knowing the characteristics of the water which is to be used. For hot water, brass will outlive iron pipe, and its initial higher cost should not prevent its installation. The water supply in some localities has been found to act on brass in such a way that the zinc is taken out and deposited as an oxide, thereby destroying the pipe. This condition would call for the use of copper. If costs must be cut, galvanized wrought iron in the basement for cold water might be substituted for the brass. This should then be run exposed, to be readily accessible in case of repairs.

Wash and Locker Room for Employes Showing Continuous Basin with Combination Fixtures

Not too much attention can be given to the matter of accessibility of pipes after they are installed. If ample working pipe space in back of fixtures cannot be had, there should be plenty of floor boxes and wall openings provided. Soil and waste runs should end with cleanouts brought through the floor, if cleanouts are not accessible from below. Basement soil mains should have cleanouts behind every branch connection, and between branches if they are over 30 feet apart, and at every change in direction.

When considering use of hot water, the question arises of where it is to be used. Many industrial buildings require hot water for purposes other than supplying lavatories, sinks, slop sinks and showers. When this condition exists, the extra initial and the maintenance costs are not great, and may be negligible, in which case there should be no hesitancy on the part of the owner in installing a hot water system for fixtures. When this condition does not exist, the hot water should be supplied only to the plumbing fixtures just mentioned. One good argument that there should be hot water is that it is the exception rather than the rule to omit it. To supply hot water is proof positive to the employe that his personal comforts have been considered, and it is always well to create the proper impression on the employe.

Cold water is run to the fixtures, and it is rare when the additional expense for hot water adds greatly to the cost of installation. The building will have steam for heating, and often for power, and use could often be made of return steam to heat the water. If direct steam were used, the load thrown

on the boilers for water heating would be small. When a hot water system is installed the best results are obtained by the use of a storage tank. By this method maximum and average demands are properly taken care of. The heating element in the tank, of whatever type, should be correctly determined for each building, so that the efficiency of the unit is at a maximum. The tank should have such accessories as a thermostat, relief valve, and vacuum valve. The material to use for the tank and coil should be determined by the same considerations as mentioned for piping. If iron pipe is to be used in the system poor results will follow if the sizes are not made liberal throughout. Many methods are employed for supplying the hot water to the proper fixtures, but whether it is a gravity or forced circulation, the overhead main supply with down feed risers returning to the tank may be given the preference. Too great an oversizing may work to the detriment of the system, if it is large, as this excess amount of water to be heated may overtax the capacity of the heating equipment.

Industrial buildings today often cover considerable ground, therefore their roof areas are large. This means that rain water disposal must be considered. Exterior leaders are probably the least practical, because they are exposed to the weather and therefore entail large maintenance cost, and since their life is not long, renewals are necessary in a few years. Interior leaders may be placed almost anywhere in the building. They can be readily run from the low points, which means that valleys may be run in any direction on the roof to best suit its needs. When the rain leader is run under a roof slab in a furred space, protection from possible freezing should be afforded. The roof connection to give satisfaction must be such that the roofer can work to it and make a finished and tight job. There are many good types on the market, and they may be had with large copper flanges over which the roofer may place his surfacing properly. The roof connection cannot be absolutely rigid; there must be some provision made for motion, and if not taken care of the roof connection will not hold. Stock connections which take care of this by having one member move on another and in which the joint is made tight by means of a gland or gasket, are readily procurable. These connections are made for either calked pipe or screwed pipe, or if they are not they may easily be altered and made serviceable for either kind of pipe. The piping to use, whether screw or calked, is always a debatable question, as in the case of soil stacks already mentioned. The rain leader as a rule should give the least amount of trouble of all the water pipes, and it may be the first pipe after the vent to be enclosed with furring.

The solution of the locker question is difficult. Lockers take up room, and it is space that is valuable, since very often, even though well planned, this area is allotted at a sacrifice. Naturally, the larger the establishment, the greater becomes this problem. A good layout will generally have a few outstanding characteristics. The locker room will be handy to the entrance and exit for employes. As working clothes are put on before starting work and removed on ending work, with this arrangement it becomes apparent that progressive motion by employes is attained. Many times this location is adjacent to working quarters, but care should be taken that the locker room does not afford the possibility of becoming a recreation room during the working hours. A crowded locker room does not work out satisfactorily. It causes congestion at quitting time, and in case of overlapping shifts much confusion arises. A well ordered establishment has the smallest possible amount of confusion. The lockers should be of a type which may be easily cleaned periodically, both inside and out. A locker with some sort of perforations not only helps in maintaining cleanliness through ventilation, but lends itself to a quick inspection without the necessity of opening the door if it be locked. Some type of a sanitary base will keep the room clean when washing down. A locker whose dimensions are too large will cause carelessness, and it will soon become a storehouse.

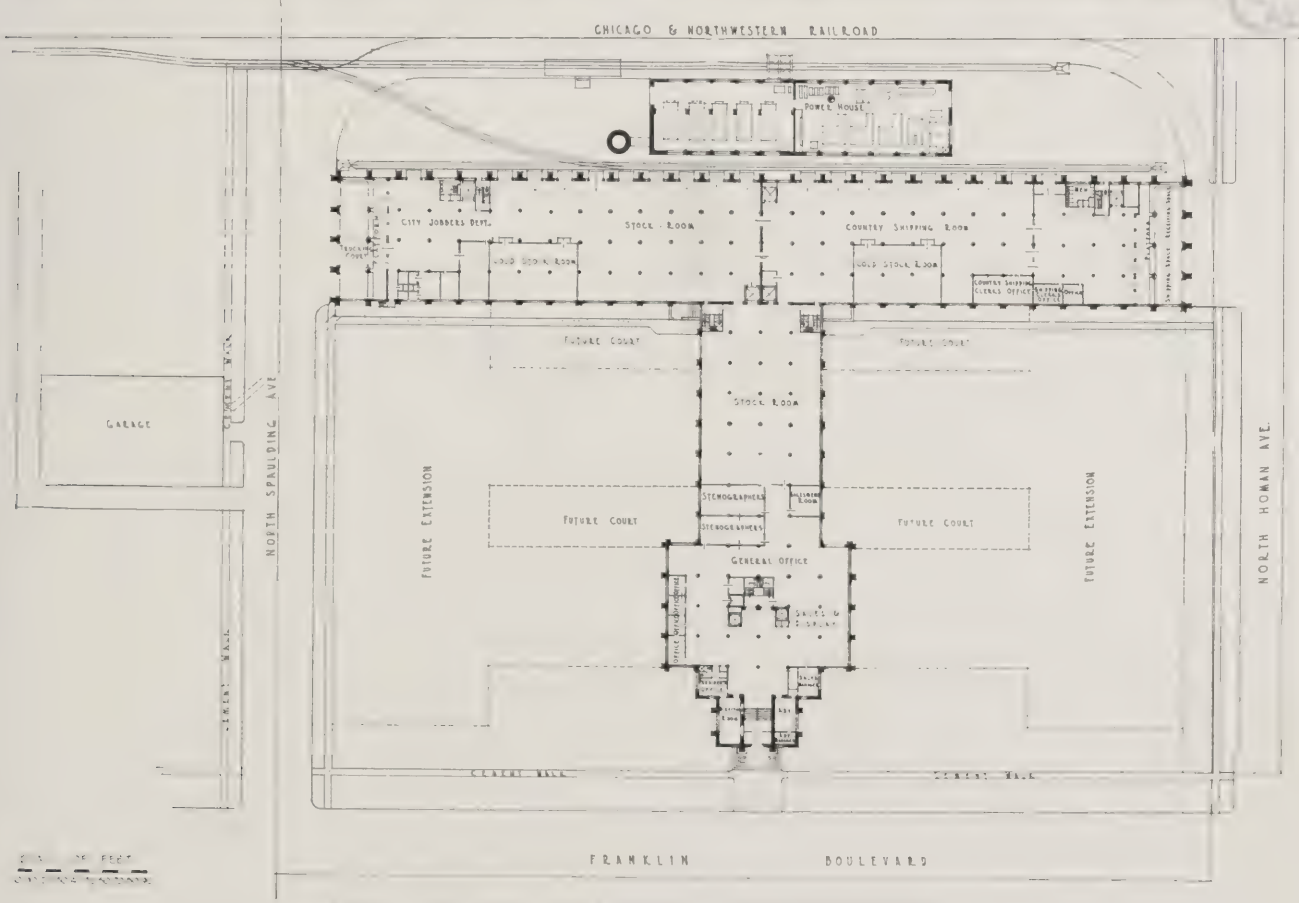
Drinking fountains should be installed in every industrial building. Those which afford the utmost in sanitary qualities and are the least complicated in the operation are the type to consider. The stream of water should be easy for one to receive, and its waste should fall free of the supply orifice. It is better to have the controlling valve separate rather than part of the bubbler. The drinking fountain as an individual fixture is to be preferred to a bubbler in conjunction with another fixture. The latter method allows but one to use the combination fixture, which often causes delay and therefore waste of time. It also has the appearance of a makeshift, and does not encourage care and cleanliness. Distribute the fountains well. The locations for the fountains are best determined after a study of floor areas and the distribution of employes, as the element of time becomes more important the greater the number of employes. Most of the industrial centers have water which has been filtered before it is used by the community, and therefore it is not necessary to have an elaborate purifying plant in the building where the people work. Cooling the water is an expensive proposition as a matter of maintenance and as to the installation of the necessary apparatus.

Since the long frontage of this structure occupies a prominent site on Chicago's system of boulevards, it has received careful architectural study. Use has been made of steel construction, the exterior materials being brick with trimming of stone and concrete. Steel sash are used for windows. It is said to be the largest candy factory in the world, but provisions have been made for future additions as indicated on the main floor plan. The plan was based on continuous study of plant operations for two months by an architect and engineer

CANDY FACTORY FOR BUNTE BROTHERS, FRANKLIN BOULEVARD, CHICAGO

RICHARD E. SCHMIDT, GARDEN & MARTIN, ARCHITECTS

VIEW FROM NORTH HOMAN AVENUE SHOWING POWER HOUSE



FIRST FLOOR PLAN WITH FUTURE ADDITIONS INDICATED

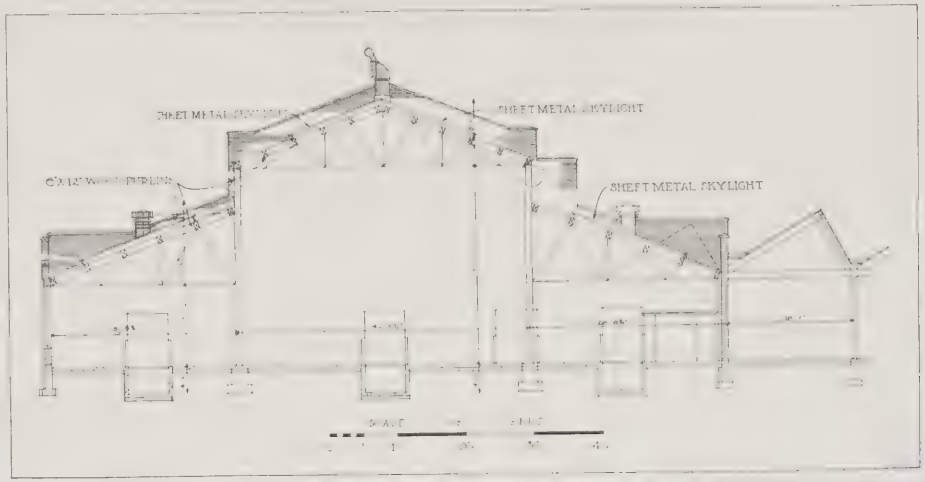
CANDY FACTORY FOR BUNTE BROTHERS, FRANKLIN BOULEVARD, CHICAGO

RICHARD E. SCHMIDT, GARDEN & MARTIN, ARCHITECTS

DETAIL OF ENTRANCE TOWER

GENERAL VIEW OF PLANT

Type of construction: Partly of 1-story sawtooth mill type, and partly of fireproof monitor type, giving daylight throughout. Exterior materials: Paving brick, laid in red mortar; stone trimmings. Heating: Direct low pressure system. General contract placed: 1921. Cubic foot cost, 30 cents. The building is used for the manufacture of small automotive parts.



CROSS SECTION THROUGH DIE CASTING ROOM

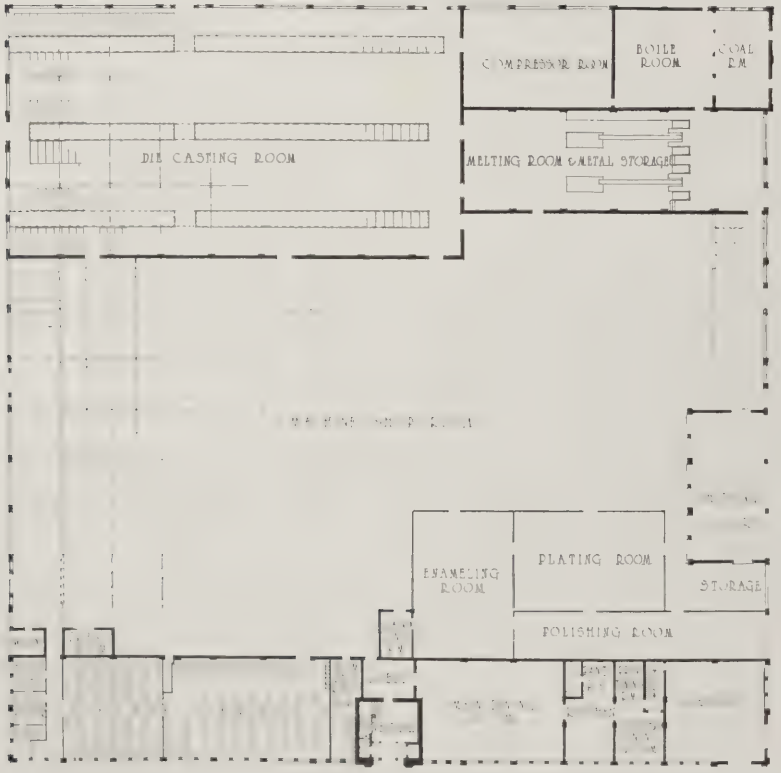
SAMUEL N. CROWEN, ARCHITECT

STEWART MANUFACTURING CO. PLANT, CHICAGO

STEWART MANUFACTURING CO. PLANT,
CHICAGO

Illustrations on Plate 47

SECOND FLOOR PLAN



FIRST FLOOR PLAN

GENERAL EXTERIOR VIEW

DETAIL OF TOWER ENTRANCE

VICTOR MFG. & GASKET CO. PLANT, CHICAGO

ALFRED S. ALSCHULER, ARCHITECT

VICTOR MFG. & GASKET CO. PLANT, CHICAGO

Illustrations on Plate 48

Type of construction: Reinforced concrete.

Exterior materials: Reddish brown, rough textured brick laid with strip joints; terra cotta trimmings.

Interior materials: Plaster walls with wood trim.

Windows: Steel sash for lower floors; wooden sash above.

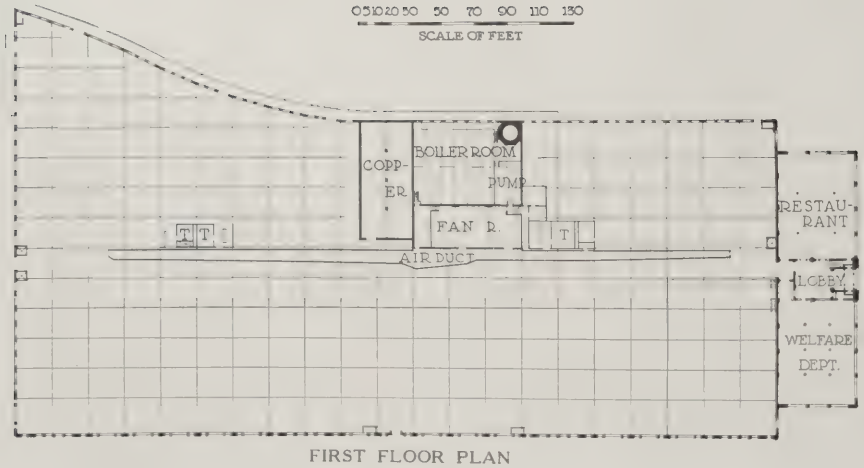
Heating and ventilating: Provided by three 150-h.p. horizontal return tubular boilers with Dutch oven extension furnaces operated at high pressure. The factory portion is heated by a hot blast system. The main supply fans are driven by an engine. The air is washed and the heating coils are supplied with high pressure steam direct from the boilers, and the remainder with low pressure steam or exhaust steam from the engine driving the blast system. The system is used for ventilation in summer.

General contract placed: 1919.

Total cost of building: $365,100.

Cubic foot cost: 20 cents.

Use of building: Manufacture of gaskets for automobile engines.



FIRST FLOOR PLAN

GENERAL VIEW OF PLANT

DETAIL OF OFFICE ENTRANCE

FIRST FLOOR PLAN OF OFFICES

Type of construction: Reinforced concrete, mill construction, and brick and steel. Live floor loads in warehouse and assembling building are 175 pounds per square foot. Plant is used for the manufacture of stoves and furnaces. Exterior materials: Hard, red machine pressed brick or washed concrete. Roofs: composition and tile.

Interior materials: Common hard brick walls with tooled joints; concrete ceilings and floors. Windows: Steel sash and factory ribbed glass. Sash in moulding shop continuous. Sash carried to within 2 inches of ceilings.

Heating: Direct radiation except in moulding shop where plenum chamber and duct system are used.

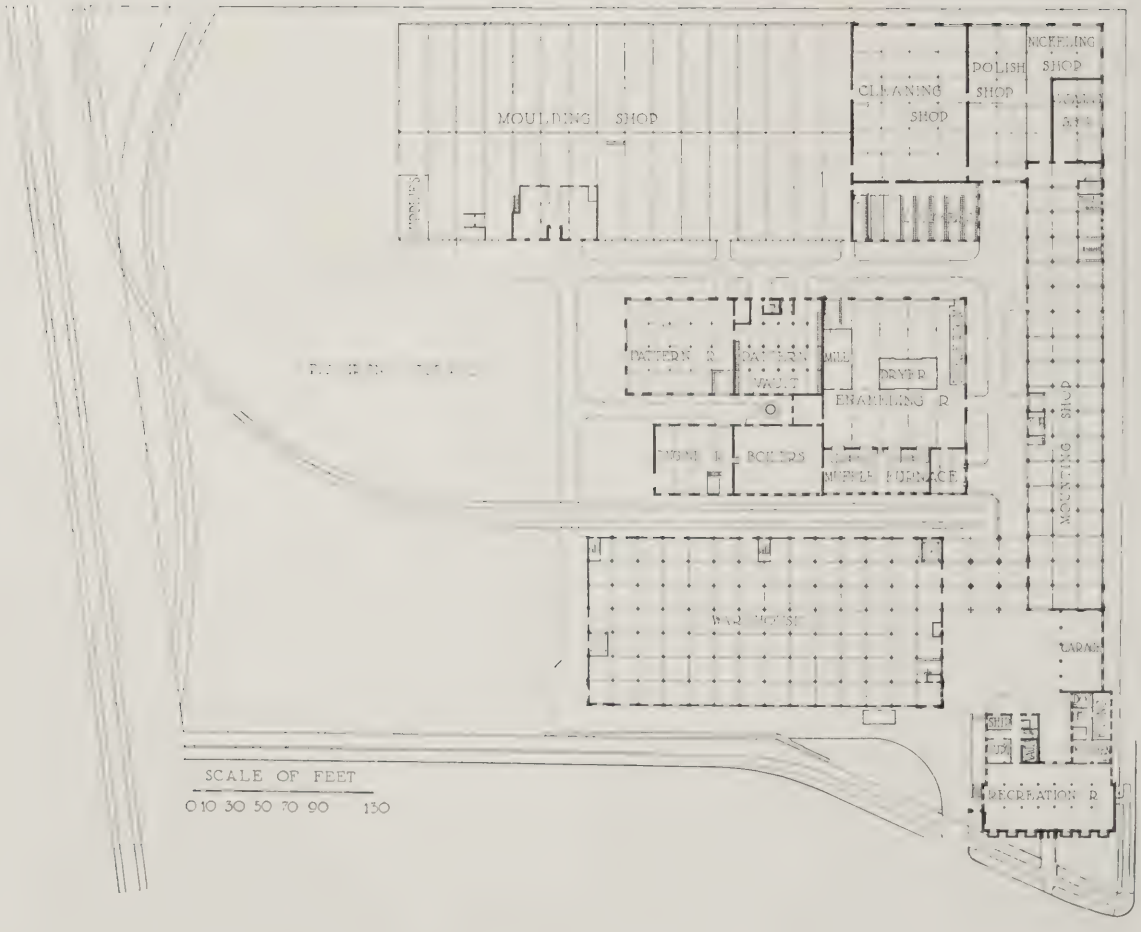
Date of general contract: October, 1919.
Cubic foot cost: 28 cents.

BRIDGE & BEACH MANUFACTURING CO. PLANT, ST. LOUIS

KLIPSTEIN & RATHMANN, ARCHITECTS

BRIDGE & BEACH MFG. CO. PLANT
ST. LOUIS

Illustrations on Plate 49



MAIN FLOOR PLAN

Type of construction: Reinforced concrete, flat-slab floors.

Exterior materials: Rough red face brick, Indiana limestone trim.

Interior finish: Oak and terrazzo and cement floors.

Floor loads: First, 500 pounds; second, 400; third and fourth, 300, and fifth, 200.

Heating: Direct radiation.

Windows: Wood and metal sash.

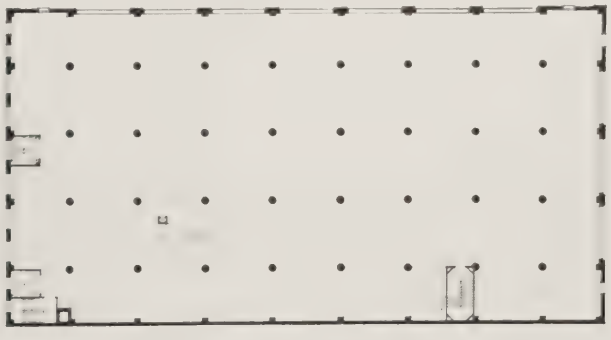
Date of general contract: October, 1919.

Total building cost: $246,731.18 (exclusive of professional fees).

Cubic foot cost: 20 cents.

Use of building: Warehouse for merchandise jobbers. Special details include a continuous chute from floor to floor for the handling of merchandise, and cold storage equipment with necessary machinery in basement.

FIRST FLOOR PLAN

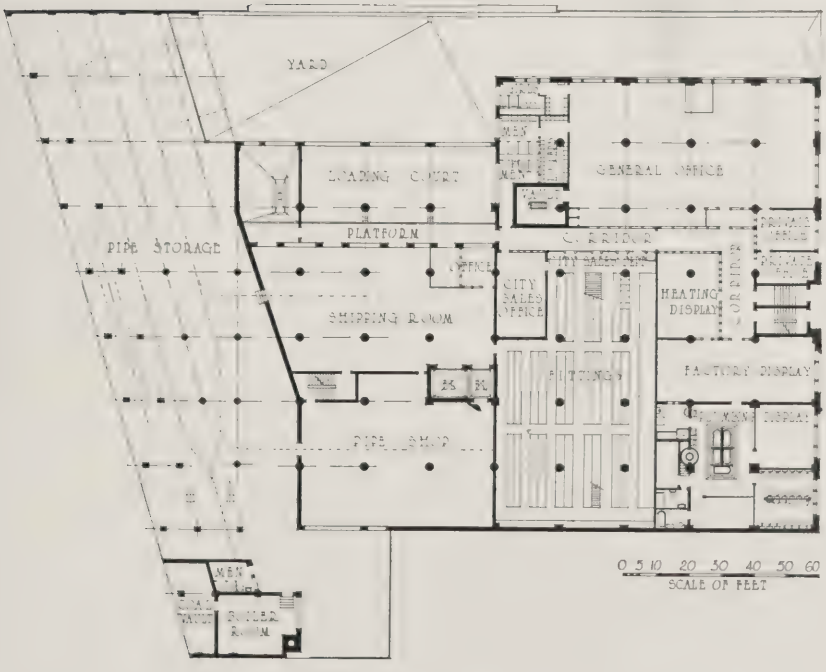


TYPICAL FLOOR PLAN

WAREHOUSE OF THE GEO. BOBB & SONS CO., COLUMBUS, OHIO

FRANK L. PACKARD, ARCHITECT

GENERAL EXTERIOR VIEW



FIRST FLOOR PLAN

Type of construction: Flat-slab, reinforced concrete skeleton; brick walls. Floor loads designed for 200 pounds per square foot. Building planned to carry two more stories.

Exterior materials: Granite and brick. Terra cotta cartouches.

Windows: Wood double-hung sash on first floor; steel sash elsewhere.

Heating: Vacuum system.

Date of general contract: May, 1919.

Total cost of building: $320,000.

Cubic foot cost: 23½ cents.

Use of building: Warehouse, plumbing and heating supplies. The display rooms for plumbing fixtures and the executive offices occupy the street frontage of the lower floor; shipping room and storage spaces are in the rear; open storage floors are above.

WAREHOUSE OF THE WALWORTH-OHIO COMPANY, CLEVELAND

THE CHRISTIAN, SCHWARZENBERG & GAEDE CO., ENGINEERS

Heating and Ventilation of Industrial Buildings

By CHARLES A. FULLER
Consulting Engineer, New York

THERE are three general types of systems to be considered in the solution of the heating problem for the average industrial plant, and they may be broadly classified as: (1) the "direct steam," (2) "forced hot water," and (3) "hot blast" systems. There are, of course, several sub-divisions under each of these main heads. Before any consideration can be given the sub-divisions, however, the first question to be answered is, Which of these particular systems is the most adaptable and the best suited for the particular plant in question?

Unfortunately, it is only in a very few isolated cases that the engineer has the advantage of being able to start with an entirely new proposition. In such a case, his one and only problem is that of economy, and by economy is meant not only operating cost, but also general health, comfort and personal efficiency of employes. Usually, however, the engineer is called in only after the plant has been in existence a number of years. Expansion has taken place along no definite, well organized lines, and the heating equipment has been installed by inexperienced contractors without consideration of economy or future growth. It is a proposition of this kind which involves the most difficult problems for solution, because the engineer is obliged to work, so far as possible, with existing equipment. Otherwise he will incur for his client heavy installation costs.

The writer has in mind a recent installation in a large industrial plant composed of several buildings of various types of construction. A forced hot water heating system would have met the requirements in an ideal manner, as to both economical use of exhaust steam and distribution of heat to the various buildings. Unfortunately, however, of all the radiation installed throughout the plant, practically none would have been applicable in connection with the use of hot water as a heating medium. The installation cost of an entirely new hot water system, with all of the existing radiation discarded, would have been so excessive as compared to that of a low pressure, steam distributing system, making use of all of the old radiation, that the interest on the additional investment would have more than counteracted the gain in economy.

Forced Hot Water System

One of the principal advantages of the forced hot water system in an industrial plant composed of several isolated buildings to be heated from a central plant is that the water can be circulated throughout the entire group from the central plant, irrespective of the relative elevations of the various buildings. The flow and return mains can be run underground or overhead as desired, and thus interference with roadways, traveling cranes, etc., can be avoided. Furthermore, the control of the amount of heat distributed to each building is entirely in the hands of the operating engineer. The flow and return temperatures can be controlled at the power plant in accordance with the outside wind and temperature conditions. A wide variation of water temperature is easily obtainable, so that the maximum and minimum can readily be taken care of. With steam distribution the temperature of the heating medium is practically constant, so that the control of the heat for varying weather conditions must be left entirely to the occupants of the building. The result is that an excessive amount of steam is used during mild weather.

Another advantage of forced hot water heating is the economy in the use of exhaust steam from generating units where the power load and heating load are nearly equal. Where condensing water is available, condensing engines or turbines can be installed and the hot water converters, used in connection with the heating system, can be substituted for the condensers during the heating season. The amount of vacuum carried on the generating units can then be varied to conform to the weather conditions and the required water temperatures on the heating system thus obtained.

Steam Heating Systems

Low pressure steam is undoubtedly most widely used in industrial heating, the distribution being obtained by means of some form of vacuum system. The term "vacuum system," as generally applied, is somewhat misleading, since it would imply that steam is circulated throughout the system below atmospheric pressure. This is not the case, however, as a vacuum is maintained only on the return system—that is, between the return trap on each heating unit and the vacuum pump in the power plant. The pressure carried on the supply main and the heating units usually varies from a few ounces to 1 or 2 pounds.

A vacuum system of steam distribution is well adapted for industrial plants, particularly where exhaust steam from generating units is to be used. The reason is that this exhaust steam can be circulated easily throughout the long horizontal runs which are usually encountered, with a maximum of 1 pound pressure on the supply main at the power plant. The back pressure on the generating units is therefore very low, and consequently their efficiency is considerably increased. The circulation throughout the plant in the mornings, before the

Fig. 1. Interior of Plant, Showing Wall Radiation with Downfeed System. Note Expansion Loops in the Supply Mains

generating units are started, is accomplished much more rapidly than with the gravity system, and the amount of live steam necessary during this period for actual heating is kept down to a minimum.

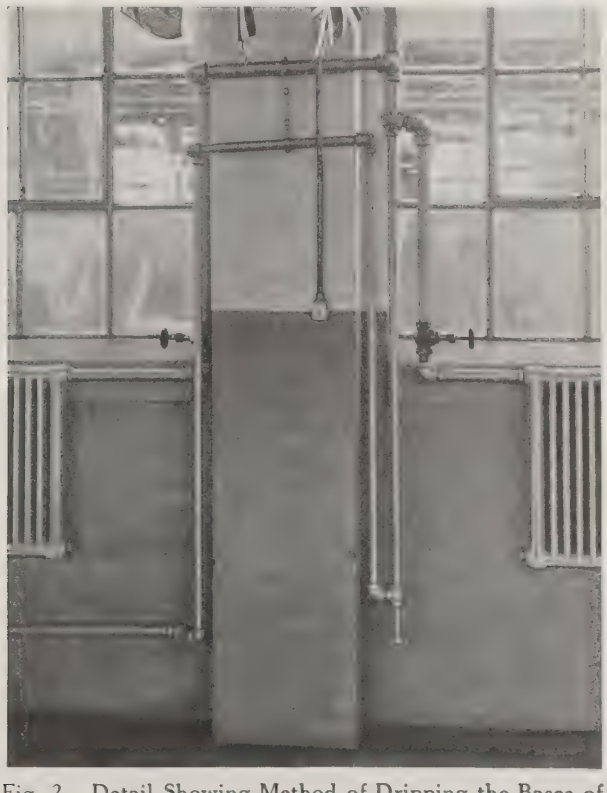


Fig. 2. Detail Showing Method of Dripping the Bases of Risers and Taking Off Radiator Connections on First Floor in Downfeed System

The downfeed system, with the distributing mains located on the ceiling of the top floor, usually provides the best type of piping arrangement for factory construction. The mains can be left exposed, and the additional radiation thus obtained will usually compensate for the heat loss through the roof. Otherwise, the sizes of the radiators on the top floor would have to be excessively large.

Fig. 1 shows the usual arrangement for the downfeed system. This also illustrates a good method of installing expansion loops in the supply mains. The method of making the riser connections, together with their cut-out valves, is also shown in this illustration.

Wall radiators are undoubtedly the best type of heating units to use in the average factory construction. In the case of such construction large window areas are usually encountered, and the wall radiators can be so proportioned as to fill the entire bay, thus providing even distribution of heat. This arrangement is clearly shown in Fig. 1, as well as the method of making the supply and return connections from the risers to the radiators. Fig. 2 illustrates a typical method of dripping the bases of these risers on the first floor, and of taking off the first floor radiator connections above the drip points. In the plant to which these illustrations refer there was no basement, and the return mains were run in trenches in the floor. The method of making the riser connections, together with their cut-out valves, is also shown.

Hot Blast Heating

There has been considerable discussion among engineers regarding the respective merits of hot blast heating and direct radiation, as applied to industrial heating. In the writer's opinion there are few cases in which the arguments do not strongly warrant the adoption of the hot blast method.

In order properly to analyze the comparison between the two systems, we must consider them from the standpoint of both installation costs and of operating costs. It seems to be the consensus of opinion that the hot blast system is more expensive to install than the direct radiating system, but the writer has found, in the cases of two different types of buildings, by direct comparison of actual estimates, that the direct system was considerably more expen-

sive in terms of first cost. In one particular case the owners obtained, from various contractors, estimates on a direct system for a new machine shop. The lowest estimate received, for this system, was $33,000. The writer was called in at this point, and a hot blast system was immediately recommended. Plans and specifications were prepared, and the contract awarded for approximately $22,000. The type of building was the standard one-story machine shop with high ceilings and a large proportion of exposed glass area. In the case of the multiple-story building, with from 12- to 14-foot story heights, the cost of the two systems would be more nearly equal, for reasons which will be given later. Fig. 3 illustrates the exterior of a machine shop at Cleveland. The conditions in this type of buildings are ideal for the hot blast system as compared to the direct system. When these two systems are designed to meet the same conditions, the comparative costs will be found to be approximately in the ratio as shown by the figures already given.

Comparative Economies

When a building of the type just mentioned is heated by direct radiation, it will be found that the temperatures in the upper portion are considerably above the temperatures near the floor line. This condition must be taken into account when the necessary radiation is being estimated. A certain percentage must be added to the heat loss through the walls and glass to compensate for the higher temperatures in the upper section of the building. The percentage to be added will depend upon the maximum ceiling height, but it should be at least 1 per cent for each foot over 12. Not only does the additional radiation thus required represent additional installation cost, but it represents also an additional yearly operating cost. With a properly designed hot blast system, the temperatures throughout the entire building can be kept practically uniform, and the excess heat loss at the upper portion can be wholly eliminated. There is also an excessive heat loss through the walls directly behind the heating coils, owing to the high temperatures at these points. Practically all of the wall spaces below the windows will be covered with wall radiation, because this is not only the most desirable, but also the only available wall space for radiator location. The amount of wall area thus covered will represent a large percentage of the total exposed wall area.

The power cost for motor operation in connection with the hot blast system must naturally be taken into account. In the writer's opinion, however, the fuel saving represented by the two plants outlined here will be considerably in excess of the expense involved.

Another point in favor of the hot blast system is the element represented by the time required to warm the building in the morning. Properly arranged recirculating dampers, which should always be provided, and ample heating surface in the indirect heating stacks, will make it possible to raise the temperature of the building much more rapidly than would otherwise be the case. Moreover, because steam will have to be supplied to the building for a much briefer period of time, a considerable fuel saving will be effected.

Fig. 4 shows the plan of the hot blast system installed in the same plant at Cleveland, the exterior of which was shown in Fig. 3. The interior of the completed installation is presented in Fig. 5. This shows the method of installing the main supply ducts in the roof trusses, and also the branch supply ducts extending down the sides of the columns. In

Fig. 3. Machine Shop, E. W. Bliss Co., Cleveland
A Type of Industrial Building Specially Adapted to Hot Blast System of Heating
Charles A. Fuller and Griggs & Myers, Consulting Engineers

this manner the entire duct system was so located that it neither occupied desirable working space nor interfered with the free passage of the traveling cranes. The air outlets were carried down to within about 10 feet from the floor, and each was provided with a damper. The angle of discharge is approximately shown in the illustration. On each side of the building there are two separate and distinct units, as shown on the plan. Such an arrangement is very desirable from the standpoint of breakdown service. Actual operation has proved, also, that it is necessary to operate only one equipment at a time during the greater portion of the heating season, if this arrangement is adopted. By alternating from one unit to the other at infrequent intervals during the day, a fairly even temperature can be maintained.

Details of Design

The building under discussion is devoted entirely to machine shop work. Consequently, the number of occupants is small in proportion to the volume of the room. The problem of design was therefore purely a problem of heating. The question of ventilation was not considered, since the ordinary leakage through the excessively large window areas was more than ample to supply fresh air for the occupants. The amount of air to be handled was therefore determined on the basis of the total heat loss from the building and an assumed maximum temperature of the entering air.

The building is 350 feet long and 125 feet wide at the floor line. There are approximately 25,000 square feet of glass, 1,500 square feet of 9-inch wall, 45,000 square feet of roof, and 43,500 square feet of floor. The heat loss was estimated on a basis of a 70° room temperature, with an outside temperature of 10° below zero. The transmission factors assumed were:

9-inch wall	.4	B.t.u. per hour
Glass	1.0	" " "
Roof	.3	" " "

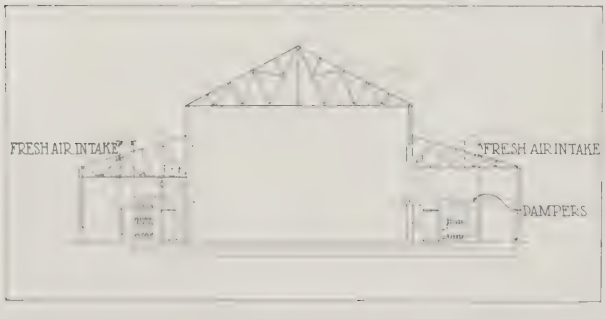
The transmission through the concrete floor was taken at .3 B. t. u. per degree of difference per hour, with 20 degrees maximum temperature difference. The total heat loss, with 10 per cent added for exposure, and 20 degrees for leakage, was 4,565,000 B. t. u. per hour. The temperature of air leaving the outlets was assumed at a maximum of 120°, an estimate which allowed for an available temperature drop of 50 degrees per cubic foot for heating. The amount of air to be handled was then obtained thus:

$$\frac{4{,}565{,}000 \times 55}{50} = 5{,}022{,}000 \text{ cubic feet per hour, or } 83{,}700 \text{ cubic feet per minute}$$

Each fan was designed to handle 45,000 c. f. m. against a static pressure of 1¼, the motor being 20-h.p. variable speed type.

The indirect heating stacks for each of the two units contained 3,400 square feet of heating surface, so arranged as to heat the total quantity of air from a temperature of 40° to a temperature of 130°. Having the air leave the heater at 130° allowed a temperature drop of 10 degrees in the duct system. The entering temperature was taken at 40° to allow for temperature in the morning.

The duct system of air distribution was designed on the basis of a friction drop of .1 inch water gauge per 100 feet of straight pipe. When the duct sizes are designed in this manner, the velocity of air in the different sections decreases toward the end as the duct sizes decrease. An equal flow of air is then obtained from each outlet without the use of deflecting dampers at the branch outlets. The velocity in the main trunk duct back of the first branch is approximately 1,500 feet per minute, and this



Cross Section of E. W. Bliss Machine Shop, Showing Hot Blast Heating Layout

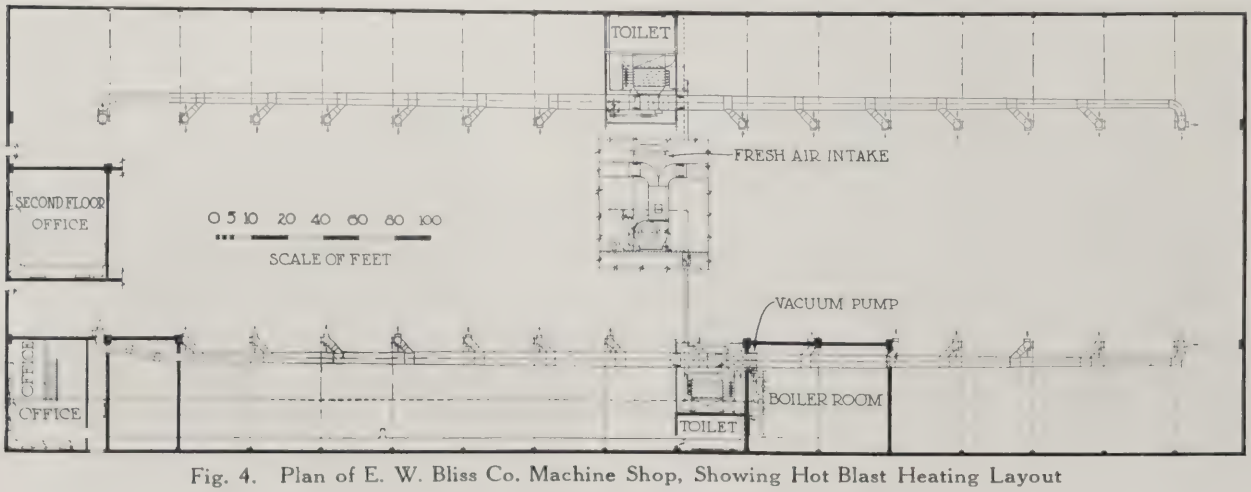


Fig. 4. Plan of E. W. Bliss Co. Machine Shop, Showing Hot Blast Heating Layout

velocity is decreased to about 900 feet at the end. The velocity in the vertical drops from the main trunk duct is decreased, immediately after the branch is taken from the main trunk duct, to 600 feet per minute and the outlet velocity to 500 feet per minute. A discharge velocity of 500 feet per minute will give a uniform temperature distribution throughout the entire room, and will not produce objectionable drafts, provided the outlets are placed at a height not less than 10 feet from the floor line.

The angle of discharge of the outlets leading to the center in the case under consideration was so arranged that the two currents of air would meet approximately at the floor line, and on the center line of the building. The outlets discharging toward the outside wall were arranged in such a way that the current would meet the floor directly at the outside wall line. All outlets were so constructed as to have the same area. The drops at each end of the duct system were provided with three outlets. One of these discharged toward the end wall, and was designed to carry 50 per cent more than the others in order to compensate for the heat loss at the ends of the building.

An examination of the sizes given on the plan will show that the dimensions of the branch connections directly at the main duct vary in size and are increased toward the end of each duct. The vertical drops beyond these connections, however, are all of uniform size, except the ends. An equal quantity of air is desired from each outlet, and the sizes of these branches are obtained on the basis of assuming that the velocity of flow from the branch duct is the same as that in the main duct at the point from which the branch is taken. Since the velocities are lower toward the end, these connections must naturally be increased in size in proportion to the decrease of the velocity.

Temperature Control

The important problem of automatic temperature regulation in connection with industrial heating is too frequently overlooked. It has an extremely important bearing upon the subject, from two distinct standpoints:

1. Economy of operation.
2. Personal comfort and the efficiency of the employe.

In regard to the first point, the average heating plant, particularly one in which steam is used, is operated in an extremely extravagant manner, when automatic regulation is not provided. Little or no attempt is made to regulate the room temperature by controlling the amount of steam distributed to the heating units in mild weather. The temperature control is usually accomplished merely by the opening of windows, a method which will frequently result in an even higher rate of steam consumption than in severe weather with the windows closed. Moreover, the windows are often left open after working hours, and sometimes even during the night, so that there is an increased demand for steam

Fig. 5. Interior of E. W. Bliss Co. Machine Shop, Cleveland
Main Supply Ducts Installed in Roof Trusses with Branches at Columns

H. C. Goodman Shoe Factory, Columbus, O. Wall Radiation and Ventilation from Ducts in Monitor

in the morning. Automatic temperature regulation, properly installed and maintained, will eliminate a large part of this steam waste. Thermostats should be arranged in such a way that they cannot be tampered with by the occupants. As to the second point, it has been found that proper control of the room temperature has a greater bearing on the physical comfort and the efficiency of the occupants than adequate ventilation. In the writer's opinion, therefore, the increased output on the part of the employe as a result of properly regulated room temperature would alone prove a good financial return.

Air Conditions

In various kinds of manufacturing plants the question of air conditioning becomes one of great importance. In textile mills the air must be kept at a constant degree of humidity in order that the fabrics may be handled with the greatest possible efficiency. In plants where various kinds of confectionery are manufactured the air must be maintained at a constant temperature as well as at a uniform relative humidity both summer and winter. Thus, in such instances, one has to consider the problem of mechanical refrigeration and dehumidification in the summer and the reverse of these processes in the winter. All of these desired conditions can be readily obtained by means of the indirect system, as outlined here, combined with the proper apparatus inserted in the air intake to the fan.

If the problem involves only the question of humidity control, as in the case of textile mills and similar plants, it is then necessary only to install some form of air washer with automatic control of the temperature of water going to the sprays and of the various sections of heating stacks. If it is desired to maintain a certain specified relative humidity with a room temperature of 70°, it is a simple matter to determine, in grains per cubic foot, how much moisture should be contained in the air entering the room. If the sprays are properly designed, the air leaving the sprays, and before entering the reheating stacks, will be saturated, or in other words will contain 100 per cent relative humidity.

By means of psychrometric charts or tables it is possible to determine the temperature of air at saturation, or "dew point," when it contains the required amount of moisture. The air will contain the desired amount of moisture if the thermostats are inserted in front of the reheating coils, controlling the water to the sprays and steam to the tempering coils. The air is then held constantly at this predetermined temperature As the air leaves the air washer it passes through reheating coils, and in some cases may be raised above the desired final room temperature as, for example, when the heating of the room is accomplished by means of the indirect system. Such procedure, however, does not affect the final desired results, as the alternate heating and cooling of the air does not change the weight of moisture contained in the air, or in other words the "absolute humidity." When the air, after entering the room, cools down to the desired room temperature of 70°, thus giving up its sensible heat to counteract the loss through exposed walls and glass, its "relative humidity" will be at the desired point. Proper allowance must be made, however, for any factors within the room which might affect these conditions, and the "dew point" or temperature of saturation as just described, must be adjusted accordingly.

When it is desired to cool the air artificially in the summer, and to maintain a constant temperature with a fixed relative humidity, the problem becomes somewhat more complicated. Let us consider for illustration a warm day when the relative humidity is extremely high. It would require only a few degrees' lowering of the temperature before saturation, or the "dew point," would be reached. In order to lower the temperature below this point, a portion of the water vapor must be condensed, or its "latent heat" removed. The amount of heat which must be extracted in order to condense the water vapor represented by a given number of degrees' drop in the air temperature is several times as much as the specific heat of air through this same range of temperature. Furthermore, as already pointed out, in order to produce a specified relative humidity at some given temperature, it is necessary to lower the temperature below the given point and then to bring the air up to its required temperature. A study of the thermodynamics of this operation will readily show why so much more power is required to lower the air temperature through a given range than to raise its temperature an equivalent amount.

The cost of refrigerating mounts so rapidly with the quantity of air to be handled that from a practical standpoint it can be considered only under conditions that make refrigeration an absolute necessity. As to the question of physical comfort in extreme summer weather, it is vastly more important to lower the relative humidity than to lower the actual air temperature in the room.

Power Provision and Steam Plant Design

By ALLEN HUBBARD

Hollis French & Allen Hubbard, Engineers, Boston

IN treating a technical subject in a non-technical manner, there is grave danger of maltreatment. In these pages an attempt will be made to give a bird's-eye view of the essentials of a steam power plant. It is hoped that the picture may illustrate some points in such a manner that their importance will be emphasized.

Essentials of a Steam Plant

The first essential is a properly designed building or space to house the apparatus. Thousands of dollars have been and are being wasted because apparatus has been crowded into inadequate or improperly arranged spaces. This can be avoided by the intelligent co-operation of the architect and the engineer. The proper arrangement is that where there is reasonable room to get at all parts of the apparatus; where the fuel is most conveniently located, and ashes can be removed economically. Steam plants are located either in specially designed power houses or in spaces provided in larger buildings, often office buildings. The best results are obtained where the building is specially designed.

Much care and thought are spent on the question of economical operation. The ideal arrangement for using coal is to have it dumped into a hopper. It then passes down through the crusher to the conveyer, and is carried up and distributed automatically into the overhead coal storage hoppers. From the bottom, opposite each boiler, is a gate and chute which feeds the coal down to each boiler. The coal to each boiler is weighed and recorded on the journey down. The stoker hoppers receive the coal, and it is gradually fed into the furnace by the stokers. The rate of combustion is shown by the recording and indicating charts and gauges. The man in charge does not touch the coal. He simply watches the indicators, and moves a lever or valve as may be necessary.

The steam flow meter shows at all times whether a boiler is carrying its share of the load. The stoker receives the coal, and as it burns it is gradually worked along to the opposite side of the furnace where periodically the ashes are dumped into the ash hopper below the boiler. An ash car or some form of conveyer is used to remove these ashes to an overhead ash storage hopper. This is arranged to store ashes for perhaps a week's run. It is arranged with a gate in the bottom, properly protected from freezing in winter, so that by simply pulling a lever a truck is quickly loaded. While such an arrangement necessitates a considerable investment, there is a tremendous saving in labor as well as economy of fuel over the man-power system.

There is a twilight zone between the large and the small plant. Each plant problem requires its own solution. In solving it, all conditions must be taken into consideration. The cost of labor, fuel, disposal of ashes, size of load, load factors, space rental and other items must be considered.

Many steam plants installed in office and similar buildings are handicapped by lack of space. There was a saving in building cost, but the owner has probably paid out many times the amount saved in additional cost for labor and fuel, due to lack of economy of his boilers. This situation, however, is easily understood. The use of steam for industrial and heating purposes has been developed principally during the last 75 or 80 years.

In earlier days buildings were heated by stoves or fireplaces, and only brick flues were provided. As the advantages of steam heat became known, it came gradually into use. Architects and contractors worked out the requirements. Gradually the architect came to realize that space must be provided in the basement for the heating apparatus. He designed the building, set aside certain spaces, let the general contract, and told the heating contractor that was where his apparatus must go. To keep down the building cost this space was often too restricted, but the apparatus worked, and the heating contractor got his money.

At the present time there is an abundance of data available and engineers know how to use it. Nearly all the leading architects today either have their own engineers, or an independent engineer makes the necessary calculation for space, and it is carefully provided in the building design. For smaller plants where there is neither space available nor coal enough burned to warrant the investment for mechanical stokers, coal conveyers, etc., as outlined here, there are less expensive hand stokers and other apparatus which tend to keep down the operating cost. Many of these smaller plants are fairly economical, but as a rule they are not as economical as the larger plants.

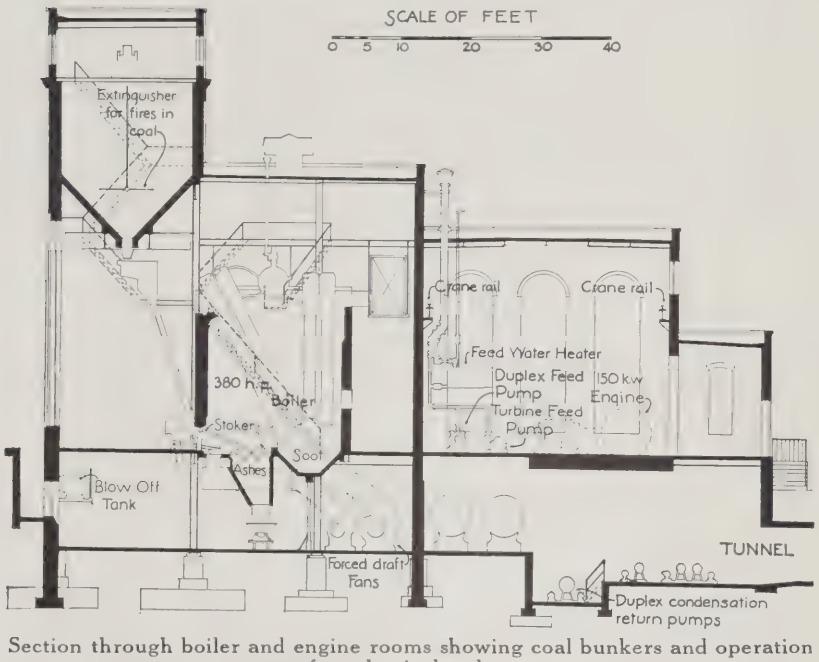
Perhaps the next most important thing is the chimney. Whether the draft is by gravity, forced or induced, or a combination of these, the chimney should always be ample. If there is possibility of future growth, the chimney should be calculated for the maximum load. It will cost comparatively little extra. We have often seen plants which have outgrown the chimney, and remedying it is usually a difficult and expensive operation.

Boilers and Auxiliaries

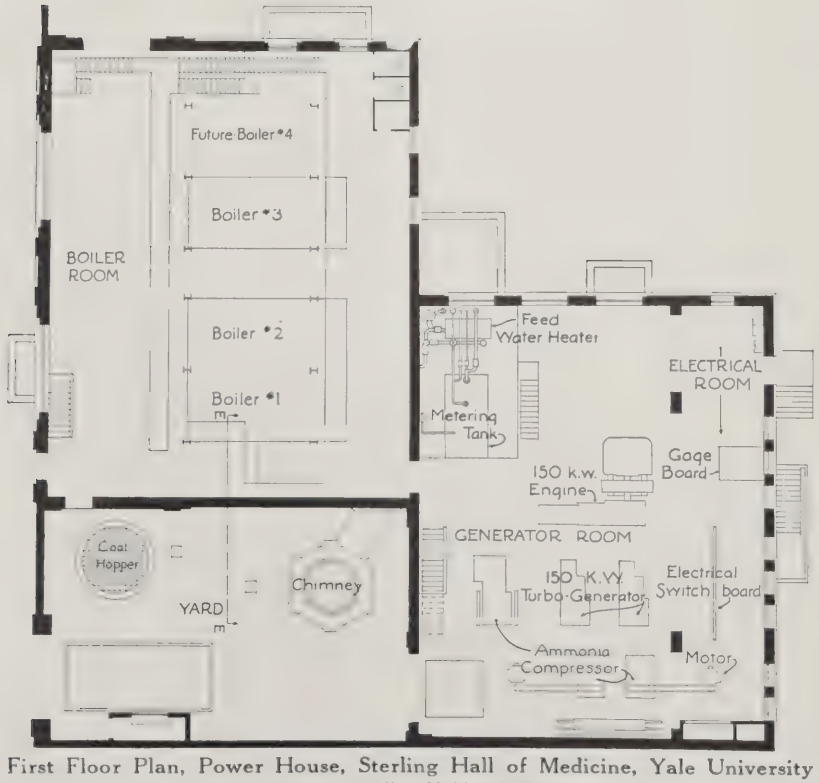
The boiler equipment is the heart of a power plant, and the selection of the apparatus and its arrangement should be given very careful study. Fuel economy is almost entirely dependent on the

success of this part of the design, and it is here that the largest share of the operating expense is involved.

There are so many considerations involved in deciding on the number and type of boilers for a given installation that it is impossible to lay down any rules which would be applicable in all cases. Each installation forms a separate problem. There is an endless variety of boilers and furnaces on the market, but in general they may be classified as being either of the fire-tube or the water-tube type. In the fire-tube type the products of combustion pass through the tubes, the water occupying the spaces around them. In the water-tube type the water passes through the tubes, and the gases surround them. As far as efficiency is concerned, tests have shown the two types to be approximately equal. Fire-tube boilers are built in commercial sizes of from 15- to 200-horse power and for pressures up to 150 pounds. It is not practical, for structural reasons, to exceed these sizes and pressure. The water circulation is not so rapid as in the water-tube type, and consequently boilers of this kind do not adapt themselves so readily to meeting the varying demands of a widely fluctuating load, where rapid forcing may be necessary at times. They do not require as much headroom as water-tube boilers for units of equal capacity, but they take up more floor space. Water-tube boilers can be made of larger sizes than are possible with the fire-tube type. They have greater overload capacity, respond more quickly to sudden demands, and are safer for higher pressures than the other type.



Section through boiler and engine rooms showing coal bunkers and operation of mechanical stokers



First Floor Plan, Power House, Sterling Hall of Medicine, Yale University
Hollis French & Allen Hubbard, Engineers

When deciding upon the type of boiler to use, it is necessary, therefore, to take into account the headroom and floor space available, the nature of the load to be carried, the size of units most desirable, and the pressure at which the plant is to be operated. If either type will meet these conditions equally well, first cost should be considered, and it will usually be decided in favor of the fire-tube boiler.

It is difficult to estimate correctly the load which a plant will have to carry, and allowance should be made for the fact that any calculations based on such an estimate can be only approximate. Provision should be made to handle the maximum estimated load, and there should be in addition sufficient reserve capacity to furnish a spare unit in case of breakdown and to permit of any units being cut out for cleaning or repairs.

The rating at which the boilers can be operated most economically depends primarily on the nature of the load. Loads may be classified into four broad groups, (1)

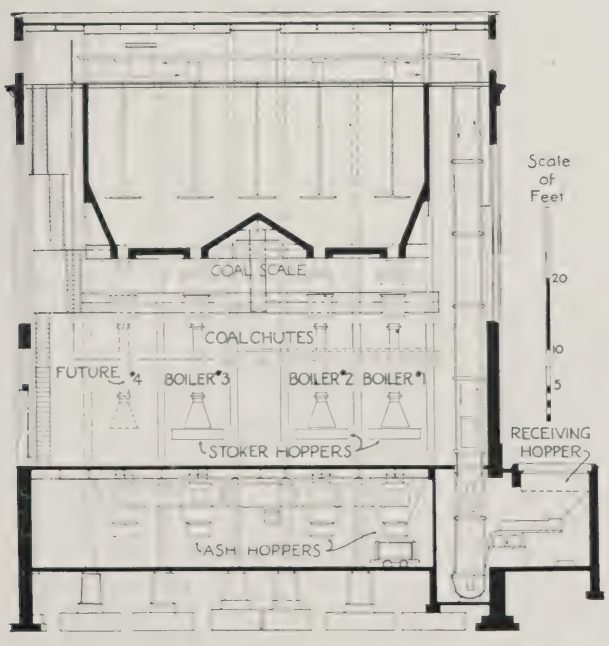
continuous constant load, (2) continuous variable load, (3) 10- or 12-hour constant load, and (4) 10- or 12-hour variable load. The most economical rating at which the boilers will run will vary with these groups. Particular care should be taken to provide sufficient intensity of draft, especially where boilers are to be run above normal rating, so that the amount of friction in uptakes and main flue can be reduced to a minimum.

The setting provided for the boilers is an important part of the equipment. Ample combustion space should be furnished, full consideration being given to the kind of fuel to be used, method of firing, length of travel of flue gases, and ease of cleaning and repairs. The ash pit should be large enough to hold from 14 to 16 hours' accumulation of ashes, so that ash removal will not be necessary during night shifts. As boiler settings are subjected to greatly varying temperatures, the design should be such as to prevent, as far as possible, any strains which will cause cracks and consequent infiltration of air, resulting in seriously impaired efficiency. Prevention of the radiation of heat from boiler settings is well worth the extra expense involved in insulating the walls. When we realize that we have a temperature of between 2500 and 3000° Fahr. in the combustion chamber, it can be easily seen how much loss is possible. The comfort of the operating staff is also increased by insulating the boiler walls, which is especially desirable where the boiler room forms a part of the building which it serves.

Whenever high overloads are to be carried it is generally necessary to install mechanical stokers. These provide a continuous uniform feed to the boilers. They also permit the economical use of cheap fuels, and give practically smokeless combustion when properly installed. They are frequently installed for the latter reasons, regardless of any other considerations. In all types of mechanical stokers the coal is fed to the fire automatically from a hopper which is usually placed in front of the boilers. If the coal is fed automatically to these hoppers from storage overhead and the ashes are automatically removed, there is of course considerable saving in labor. The success of such installations depends on uniformity of feed, proper proportions of air and fuels, and use of self-cleaning grates.

Economizers are often used to reclaim as much as possible of the heat from the flue gases. They usually consist of a series of vertical tubes surrounded by an iron casing. The feed water passes through the tubes, and the waste gases from the boilers pass over them. The resistance to the flow of gas through the economizer is taken care of by means of an induced draft fan. Often the fact that such a fan is installed is used as a reason for decreasing the height of the chimney, but this is not always advisable since the flue gases at times may have to be carried off by gravity, owing to the economizer or fans being out of commission. If the apparatus is installed in duplicate it is a question whether any economy is possible, owing to the cost. In considering the advisability of installing economizers, not only the cost of the apparatus should be taken into account, but also the extra cost of the building, due to the considerable extra space necessary for using this equipment.

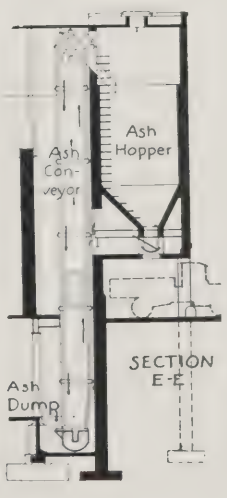
Practically all modern central stations and large isolated power plants are equipped for the use of

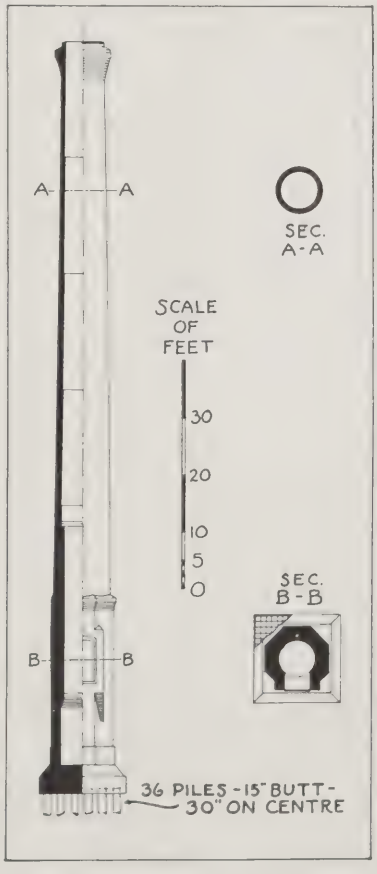


Section through coal bunkers and elevation of boilers (at left)

Section through ash hopper (in center) showing automatic handling of ashes.

Typical stack detail (at right)





superheated steam. In determining whether superheaters should be installed, such items as type and size of prime movers, character of service, first cost, piping, upkeep, etc., should be considered. With a properly designed superheater, integral with the boiler, the overall efficiency is usually somewhat higher than if saturated steam alone were generated. The increased economy of the prime mover may also make possible a reduction in the sizes of boilers, condensers and other auxiliaries.

Boiler feed pumps should be of ample capacity to carry the load at all times, with a spare unit for use in case of breakdown or repairs. Two types are in use,—reciprocating and centrifugal,—the former being the most popular, the latter, however, being gradually used to a greater extent in large plants. It should be remembered that the smaller sizes of centrifugal pumps have a comparatively low efficiency and should be avoided. When centrifugal pumps are used they may be driven by either steam or electricity. The choice will be determined by the conditions in respect to cost of current, etc. at the plant under consideration. In case electric drive is decided upon it would be wise to provide a steam-driven spare unit which could be started when the electric current is cut off for any reason. Reciprocating pumps should be large enough to carry the maximum load when running at a low speed, as this will tend towards prolonging the life of the apparatus and minimizing the cost of repairs.

It is not good practice to feed cold water to the boilers, and a feed water heater is usually provided to preheat the water. As there is generally a certain amount of exhaust steam available, for which there is no other use, considerable economy is realized by the use of this piece of apparatus. Even in those plants where the exhaust steam can be used for heating purposes, it is available for heating feed water during the non-heating season. Two types of heater are in general use,—the open and closed types. In the open type, the exhaust steam comes into contact with the water to be heated. In the closed type the steam and water are kept separate, the heat exchange taking place through the tubes of the heater.

It is important that return tanks for the reception of condensed steam, which is to be returned to the boilers, should be sufficiently large, since otherwise a considerable amount of hot water may run to waste owing to the fact that whenever the plant has been shut down and started up again, the amount of returns is for a time greatly in excess of that during normal operation.

An accurate record of the amount of steam generated should be kept, and for this purpose there are several makes of steam flow meters on the market, any of which are satisfactory. There should be a separate meter on each boiler. This device, together with an automatic coal scale for each boiler, will furnish a record of the overall efficiency of each boiler. In many cases it is good practice also to meter the returns. In plants where part of the steam is used in such a manner that the condensate is wasted, the combination of steam flow and condensate meters is especially valuable.

As all natural waters contain some impurities, it is usually advisable to provide some means of treating the feed water to prevent or reduce the formation of scale. The method to be used depends on the impurities present, and can only be decided after chemical analysis of the water.

Intelligent operation of the boiler plant is necessary to obtain the best results, no matter how well designed and equipped it may be. But however skillful the operating staff, it is at a great disadvantage if means are not provided for indicating just what is happening. Wherever practicable, instruments showing a continuous record should be installed. Among the most important items in this connection are those recording steam pressure, draft, flue gas temperature and composition, weight of coal fed to grates, weight of steam generated, temperature of feed water and temperature of returns. Sometimes an owner may decide to omit such recording devices on account of their cost. This is a mistake, for they well repay the outlay involved. Not only do they furnish him with information by which he can see for himself the manner in which the plant is working, but the psychological effect on the working force is a valuable asset.

Much of the apparatus which was formerly controlled by hand is now controlled automatically. At some point, however, the operator's attention should be focussed, and the extent to which use of automatic control is to be carried should be given very careful consideration in designing the details of the plant.

Piping

The mechanical equipment of the plant having been determined, consideration should be given to the piping system, and this should be done before the final dimensions of the space required for generation of power are fixed. Otherwise conditions may later arise requiring considerable modification of the original arrangement. With the increased cost of construction there is a tendency to eliminate the apparently unnecessary spaces for pipes. No greater mistake can be made than to cramp all sorts of piping into inadequate spaces where they cannot be reached for repairs.

It is, of course, understood that piping is necessary to make connections between the various pieces of plant apparatus and to the heating, domestic and process systems of the buildings served by the plant. These include high and low pressure steam, hot, cold and distilled water, compressed air, vacuum, vacuum cleaner, oil piping, refrigeration lines and possibly others if required for process of manufacture.

This being a condensed description, it is impossible to deal with elaborate specifications of pipe and fittings to be used in the various lines. In most of the lines there are well defined standards for pipe, fittings and valves. Special attention should be given to hot and cold water piping and to piping used for returning condensate to boilers, as the materials used are determined largely by the geographical location of the plant. For instance, water in certain localities requires the use of genuine wrought iron pipe for heating returns, whereas the steel pipe would be most economical. Another important item to be considered in the design of the piping systems is expansion and contraction in long runs. Failure to consider this may result in injury to the plant or continual expense to the owner on account of leaking joints and strained valves which cannot be shut tight. State and municipal boards and fire underwriters have numerous rules regarding oil, air and gas piping, and these should be consulted before installations are made, as they may even require some special construction in the building itself.

Valves and Valve Control

The demand for more elaborate systems of piping, largely for economic reasons, leads up to the question of valves and valve control. The number of valves required for a given system will vary with different designers. In general, valves are installed so as to shut off one piece of apparatus or section of piping so that all other parts of the plant can continue in operation. All branch lines on water, gas and air systems should have valves for the same reason. The desire to eliminate waste and prevent accidents has resulted in the design of many automatic valves, and the tendency to eliminate unnecessary manual labor has resulted in the extensive use of remote controlled motor-operated valves.

Piping System Codes

Marking of piping and valves has been the subject of considerable thought of late years, especially in industrial plants where a variety of lines are installed. Pipe lines are usually identified by giving easily distinguished colors to the different lines and by painting all of each line its given color, or else by painting piping a standard color with a narrow band of the distinctive color at say 5-foot intervals. Another scheme adopted is to have the piping, whether it is covered or not, a standard color, and the fittings and valves painted the key color. Most large industrial plants and power plants have worked out color schemes for their own use. The number of schemes is varied, and for new work can be rearranged to suit the wishes of architects, engineers or owners. This identification scheme has not been used to any great extent in office and public building work, because the number of lines is comparatively small, and they can usually be identified by connections to apparatus or by valve markings, a system which is comparatively simple.

The marking of valves is also an important factor in the completion of a plant. If complete and accurate, markings are a great help to employes; if inadequate, they are apt to cause trouble. The old scheme for marking valves was to attach to the wheel a brass or paper tag stating what piece of equipment or portion of building was controlled. Due to the more complex design of buildings and piping, the scheme of numbering all valves with brass tags and posting a valve diagram in a prominent place is more satisfactory. The diagram shows the location of each numbered valve, and a table with the diagram describes as accurately as possible the function of each valve.

Conduits and Tunnels

Where the power plant is installed as part of the main building, the question of piping connections is a comparatively simple matter. Where the power plant is a separate building, piping connections to the main buildings require careful study. Steam lines in particular cannot be buried in the ground without some sort of protection. This protection may take the form of wood stave covering, terra cotta tile, or concrete walking tunnels. When the last scheme is used, it is customary to install other equipment piping in the same tunnel. The wood conduit has been used extensively in certain localities, but should be considered very carefully where there is a possibility that ground water may be encountered. Terra cotta conduit is proving satisfactory in a great many installations. Care must be taken to provide proper under-drainage, otherwise ground water may work into the conduit and in time ruin the insulation and pipe. Neither conduit will give the protection and chance for inspection and changes that a concrete tunnel provides. To be of use tunnels should be at least 7 feet high inside; for lines on one side only not less than 4 feet wide, and for lines on both sides a tunnel 8 feet wide is none too large. Supports for tunnel and conduit piping, care for expansion and weights of materials are important, especially in long, straight runs.

Covering

It is common practice in most plants to cover all steam and water piping. This covering is primarily to eliminate heat loss (on cold water to prevent sweating) through radiation, although it is now quite common to cover exposed piping in office and public buildings so as to give a more complete control over room temperatures. Carbonate of magnesia and asbestos air cell coverings are most commonly used for steam piping and wool felt for hot and cold water lines. For general use, standard thick covering (⅞ inch thick for small sized pipes to 1¼ inches thick for large lines) is satisfactory. On boiler and engine room piping and tunnel piping double covering can be used to advantage in order

to keep down the temperature of the surrounding air. At pre-war prices there was considerable saving if air cell covering was used instead of magnesia. At present prices, however, the costs of the two coverings applied are very nearly the same. Large cylindrical or large flat surfaces are usually covered, first with air cell or magnesia blocks wired on, and then with magnesia or asbestos plaster with smooth finish.

Fuels and Fuel Handling

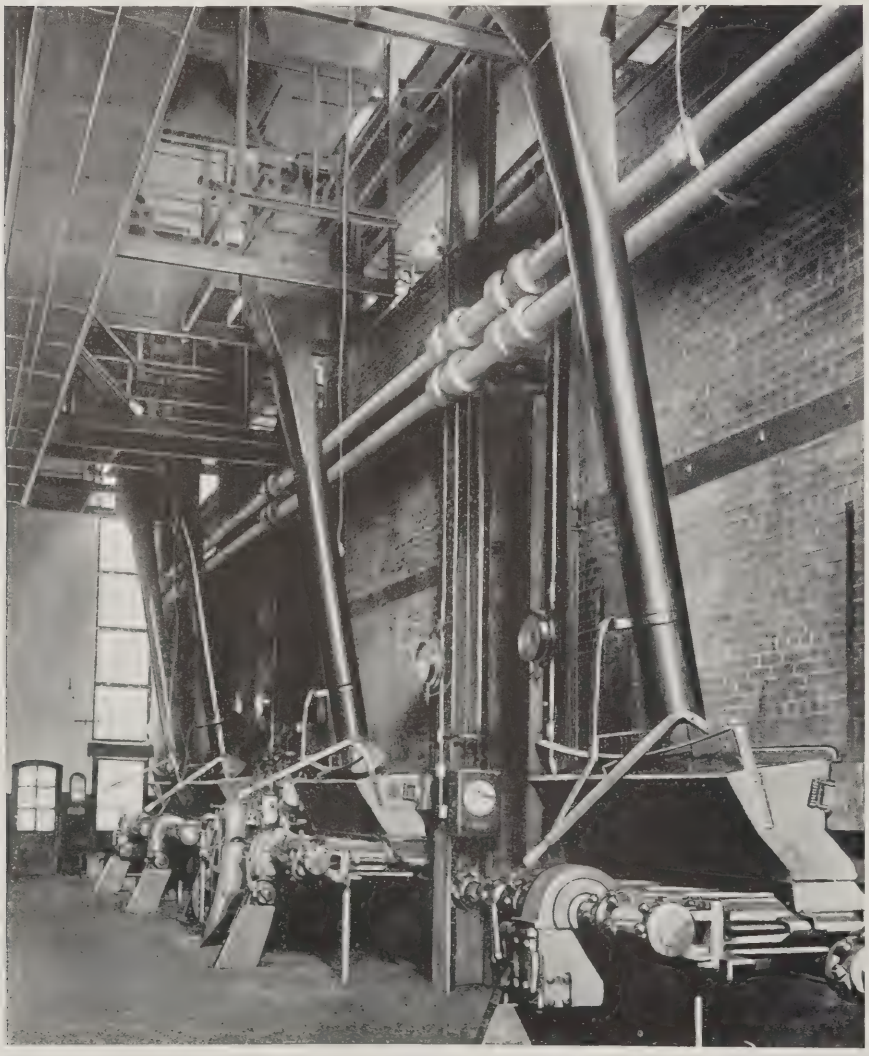
The coal saving made by the use of pipe covering is an important factor in these days of high fuel costs. Take as an example a steam pipe surrounded by 70° air and carrying steam at 5 pounds pressure. If this pipe is not covered there will be radiation loss of about 480 heat units per square foot per hour. If the same pipe is covered with standard thickness magnesia covering, 85 per cent of the heat will be retained in the pipe. By the use of special covering, it is possible to arrange for 90 to 95 per cent of this heat to be retained.

The great majority of steam power plants use either soft coal or oil for fuel. Most of the coal-burning plants receive their coal either directly from cars run to the plant siding or from coal trucks, while the comparatively few plants located on tide-water receive their coal from barges towed alongside.

The coal used is generally that obtained from the nearest reasonably good coal field, and the fuel handling and steam generating apparatus is that arranged to handle and consume most economically that particular grade of fuel. Adequate storage space, either in coal bunkers or in storage yards for the large plants, should be provided, unless a more or less continuous small lot delivery by truck can be depended upon at all times. The method of handling coal in hand-fired plants is so well known that only plants where economic operation demands automatic machinery will be considered here.

Soft coal as received from the mine contains lumps of varying sizes, some of which are too large to be readily handled or economically burned. To obtain the proper sizing of the fuel, all coal, before being placed in the overhead bunkers, is passed from the storage bunker or directly from the car or truck, through a "crusher," a machine consisting of revolving drums with teeth, between which the coal is automatically fed, thus reducing the large lumps to the proper sizes.

The elevating, or elevating and distributing conveyer, consists of an endless chain on which are mounted buckets which are filled as they pass under the chute from the crusher and arranged to elevate and dump automatically the coal on the distributing conveyer or in the overhead bunkers, as the case may be. The distributing conveyer is a similar device of bucket or belt type, except that it is arranged to receive the coal from the elevating conveyer and to carry it to and automatically dump it in the several overhead bunkers. The general arrangement of the plant determines whether or not it is necessary to use a distributing conveyer, and it is usually better to arrange the apparatus so that this device is not required. The overhead bunkers should be



Boiler-Room, Central Power Plant, Yale University, New Haven
Note mechanical stokers fed from coal bunkers above
Hollis French & Allen Hubbard, Engineers

placed high enough so that coal can be fed by gravity through a chute, either directly to the stoker hoppers or through an automatic coal weighing machine and thence to the stoker hoppers. To obtain the highest efficiency, the coal being fed to each boiler should be weighed, and the best of the larger plants are therefore equipped with automatic coal weighers installed for this purpose.

Steam plants located at tidewater or where coal deliveries are irregular should have large storage bunkers or storage yards. Where such storage is required, a traveling crane is often used so that the coal may be piled over a considerable area and still be readily conditioned, weighed and fed to the stokers. When required in the plant, the coal from the storage bunkers or yard is carried by the crane, or trucked, to a hopper which empties into the crusher, and the fuel then passes to the boilers as already outlined.

In order to reduce the fuel cost, many plants are designed to burn a mixture of high grade soft coal and coal of a lower quality, or screenings. Where storage must be provided for plants using mixtures, provision should be made for storing the different quality coals separately. The mixing is then done as the coal is used, and the proportions can be changed to meet variations in the calorific value or burning qualities of the coals.

Pulverized coal is one of the later developments for coal-burning plants, and with this system the coal is ground to a powder, then thoroughly mixed with the proper amount of air furnished by blast fans, and the mixture fed to the boilers in the form of a coal and air blast. The apparatus is designed to obtain as nearly perfect combustion as possible, and produces a very hot fire.

Mechanical stokers automatically dump the ashes either continuously or periodically into the ash pits. The ashes are removed from the ash pit mechanically or by hand. In either case the ash pits are in the form of hoppers with chutes from the bottom. These chutes discharge the ashes to either a car or a conveyer, either of which is arranged to carry the ashes to an elevating conveyer of the bucket type, arranged to automatically dump into an ash storage space. This ash storage is arranged at the proper elevation and position so that the ashes can be drawn therefrom through a chute and dumped into railway cars or trucks.

A properly designed coal-burning plant is very efficient. The coal consumed is controlled automatically to meet the varying load conditions, and fuel is handled with a minimum of labor.

Oil-Burning Plants

Oil-burning plants are of two general types,—steam atomizing and mechanical atomizing,—the difference being in the method of atomizing the oil and the introduction of air for its combustion. The selection of the type depends upon the design of the plant and the character of the load. Both types require oil storage tanks, pumping equipment, oil heaters, oil burners, and regulating devices for controlling the flow of oil and the air admitted for combustion and draft. Both can be used on natural, or induced draft, and the mechanical type can also be equipped with forced drafts.

Oil storage tanks should be of sufficient sizes to insure an adequate supply of oil at the plant, and are preferably located outside the plant and below the ground. In commercial buildings this is often impossible, and in this case the storage tank may be within the building, either below or above the boiler room floor, the former being far preferable.

Fuel oil when cool will not flow readily, and it is therefore necessary to provide steam heaters at the suction to heat the oil to about 90°. The warmed oil is then drawn by pumps from the storage tank and forced through a second heater, which is controlled by a thermostat, and delivered to the burners under comparatively low pressure for the steam atomizing, and under high pressure for the mechanical atomizing type. The atomized oil is forced into the combustion chamber where it mixes with the air, vaporizes, and is consumed. The various devices for burning fuel oil are very complete, can be controlled to maintain a uniform steam pressure under varying loads, and can be made entirely automatic. Oil-burning plants are clean, can be operated with a minimum of labor, and on account of the uniform flow of oil to the burners the air admitted can be regulated very closely, resulting in a high boiler efficiency.

Coal vs. Oil

Coal and oil are now competing fuels, and the question of fuel selection arises for each plant. This question involves two considerations,—first, the economic aspect over a period of years from the point of view of the country at large, and, second, the mechanical efficiency and money saving to the owner in operating costs. Our reliable information indicates that the natural coal resources of this country are, for all practical purposes, unlimited, but that the natural oil resources are very much smaller and that they may be exhausted in a comparatively few years under our present rate of consumption. If this be true, we would then be dependent upon oil shale and upon foreign fields for our oil supply. This situation would be serious and might prove disastrous in the event of this country's being at war. An adequate oil supply is now absolutely necessary to carry any such operation to a successful conclusion, and the amount of oil needed would be enormous. Government regulation of the use of crude oil for fuel in stationary steam plants is the most reasonable way of fairly conserving our natural oil supply, and this possibility is a factor to be considered in the selection of the fuel. The considerations determining fuel selection are cost, including maintenance, continuity of supply, labor and fixed charges.

Artificial Illumination of Industrial Plants

By A. L. POWELL, *Illuminating Engineer*

A COMPREHENSIVE discussion of this subject would require volumes rather than the few pages at our disposal. Years of study have been spent on this question, and much valuable data have appeared in the technical press. In spite of this handicap, it is our aim to outline a few of the fundamental principles which must be followed, and the relation of artificial lighting to overall efficiency.

Since all our industrial activity cannot be confined to daylight hours, it is obvious that some means of providing a substitute for natural light must be considered. All too frequently does a manufacturer provide the minimum amount, thinking of artificial lighting as an unavoidable expense when, as a matter of fact, proper lighting is one of his best aids in efficient plant operation.

A few years ago the practice in lighting a factory was to hang a lamp over each workplace, with possibly a few additional units in clusters for general illumination. This condition was necessary, due to the low efficiency and small sizes of the available light sources. Such a system has many disadvantages. Now, with efficient lamps, available in a wide range of sizes, the practice is to hang lamps well above the work, out of reach and above the ordinary angle of view. In this manner approximately uniform illumination is secured, often much better than the distribution of daylight.

Everyone realizes that a lamp in itself is not a complete or satisfactory lighting unit. It requires something, first, to shield the eye from the bright light source, and second, to direct the light where most needed. To accomplish these results we use suitable reflectors or diffusing devices. There are many excellent types of industrial reflectors on the market, some best suited for one set of conditions, and some for another. Industrial lighting involves the selection of the right kind of reflector and the use of the proper size and type of lamp correctly spaced and hung at such a height as to give the desired distribution of illumination. Obviously, different processes require varied amounts of light, depending on the character of work, finish, color, degree of accuracy necessary, etc. This is specified in foot candles, the unit of intensity.

We may well consider three main sections of the plant, (1) shipping platforms and courts, (2) manufacturing area, and (3) storage spaces, and on this basis analyze the treatment desirable.

On the shipping platform, suitable light will insure greater actual speed of trucking, make markings more easy to read, result in fewer mis-sent shipments, reduce spoilage and theft, and in the case of common carriers, will improve relations with the public. The demands for vision are not exacting, although tags, waybills, markings, etc., must be easily read. The quality of light, as regards diffusion in this part of the plant, is not as important as in the manufacturing areas. A unit giving reasonably good diffusion, emitting its light in an efficient manner, and distributing it over a wide angle, is desirable here. The standard dome reflector (Fig. 1), equipped with a bowl enameled lamp, meets the requirements to a remarkable degree. For a narrow platform, a single row of such units, spaced symmetrically, hung well above the center line of the platform, if not too wide, generally solves the problem. From 3- to 6-foot candles should be effective on the floor. This intensity will result with the type of unit recommended, if approximately ½-watt per square foot of area is

Fig. 2

Fig. 1

Fig. 3

Fig. 1. RLM standard dome reflector and bowl enameled lamp

Fig. 2. Typical prismatic glass direct lighting reflector of high efficiency

Fig. 3. Large white enameled steel reflector and an auxiliary of opalescent glass to diffuse the light

provided. Knowing the spacing and width of the platform, it is a simple matter to calculate the size of lamp which should be installed. If the platform is unusually wide, two or more rows of units, symmetrically placed, may be necessary in order to secure a uniform distribution of light. If the shipping platform is directly visible from the street and it is desirable to introduce a certain amount of decoration for its advertising value, then diffusing, enclosing units of an ornamental type might well be used. As this equipment is less efficient than the type previously recommended, slightly higher wattage should be installed.

In manufacturing areas, the system known as general lighting is now almost universally employed in the modern plant. An approximately uniform distribution throughout the area is secured, overcoming many of the difficulties encountered with the old-fashioned local lighting, where small lamps are placed close to the working point. This uniform

Fig. 4. Night view of general manufacturing area, 200-watt bowl enameled lamps in standard reflectors. Four outlets in 20-foot bay. Intensity of illumination over 12-foot candles

Fig. 5. Night view of a foundry lighted by 300-watt clear lamps in standard dome reflectors, 35 feet above floor; 10-foot centers in 40-foot bays. Resultant intensity is 5-foot candles

distribution is secured through the choice of the proper reflectors or globes, spacing these according to predetermined values, and hanging them at the correct heights. The size of wattage of lamp used governs the resultant foot candles or intensity of illumination. On a given spacing, larger lamps will produce more foot candles. Local or individual lamps have a certain field in industrial lighting, but this is not by any means as large as the uninformed imagine. There are some classes of work, such as the assembling of watch parts, which require such a high intensity, in order that the minute details be clearly visible, that it would be uneconomical to provide this with the overhead system. Such cases, however, are the exception rather than the rule. Again, where extremely large overhanging parts prevent the penetration of light, small auxiliary units are essential. Finally, certain classes of work in a vertical plane, such as horizontal boring and the moulding of deep forms, frequently require hand or drop lamps. The sum total of all of these instances, however, is remarkably low when we consider the plant as a whole.

It is usually desirable to space outlets for general illumination symmetrically with regard to the bays or columns. As a general rule the maximum spacing should not exceed the ceiling height for work with exacting requirements. Thus, in a room with a 12-foot ceiling, we would have four outlets on 10-foot centers in each 20-foot bay. In a room with a 20-foot ceiling, outlets might be on 20-foot centers. The exact spacing of outlets will be a matter of plain common sense. If it is apparent that certain outlets will be above a piece of equipment which would cast a shadow, then one's judgment indicates they would not be useful there. A symmetrical arrangement may still be followed, for it does not require much ingenuity to shift rows of units a few feet to avoid obstacles and to insure correct direction of light on the work.

Various industries have lighting requirements peculiar to themselves in the manufacturing areas. There are, however, four general grades of work requiring intensities of these orders:

Processes where slight discrimination of detail is essential, such as rough machining, rough assembling, rough bench work, rough forging, grain milling, etc., 2- to 5-foot candles.

Work where discrimination of detail is essential, such as machining, assembly work, fine core making in foundries, cigarette rolling, etc., 4- to 7-foot candles.

Work where close discrimination of detail is essential, such as fine lathe work, pattern and tool making, weaving light colored textiles, etc., 6- to 10-foot candles.

Work where discrimination of minute detail is essential, such as watchmaking, engraving, sewing on dark goods, inspection, etc., 10- to 20-foot candles, and even more.

As already said, many types of equipment are

Fig. 6. Night view of winders in a silk mill lighted by 200-watt lamps in mirrored glass indirect fixtures, two in each bay

available for industrial lighting. The standard dome reflector and bowl enameled lamp, shown in Fig. 1, satisfactorily meet the requirements of nearly 80 per cent of the industrial processes. Another very efficient unit is the prismatic glass, deep bowl reflector, shown in Fig. 2. This is usually equipped with a clear lamp, and hence leaves something to be desired regarding diffusion. Where light must be produced from the sides of an area, or where maximum illumination of vertical surfaces is essential, the angle type, porcelain enamel steel reflectors are used.

For high-grade industrial lighting, a new unit, shown in Fig. 3, is appropriate. This consists of a large dome steel reflector and an auxiliary diffusing globe, fitted around the lamp. Small openings in the top of the reflector permit some of the light to go upward, rendering the ceiling luminous, making the room more cheerful and promoting safety while working around shafting and belting. At first thought it might seem that such a unit was not efficient, but tests indicate a high output, accompanied by excellent diffusion, which always results in soft illumination.

Whatever type of lighting unit is installed, the side walls and ceilings in the plant should be painted a light color, preferably white. A darker dado, approximately 4½ feet high, is desirable for a neat appearance. The ceiling and side walls are of considerable importance in reflecting and diffusing the light. The reflected light penetrates beneath overhanging parts, and materially softens or avoids shadows at operating points.

In storage areas, the light should be quite evenly distributed, since labels and markings must often be read, yet the demands in this respect are by no means as exacting as where close visual work must be carried on. The intensity should be highest nearest the doorways and down the main aisles, for here is found the densest traffic. An average intensity of at least 1-foot candle is desirable, this being obtained by using approximately ¼-watt per square foot of floor area where modern efficient lamps and standard dome reflectors are in service. These rules on maximum desirable spacing apply:

Ceiling 10 feet or less .....16 feet
Ceiling 10 to 15 feet .....20 feet
Ceiling above 15 feet .....30 feet

With ceilings averaging 15 feet, one outlet in the center of each 20-foot standard bay is good practice.

Regardless of the type of lighting installed, if it is to remain satisfactory and adequate, a regular system of maintenance must be in force. A slight layer of dust on lamps and reflecting surfaces materially reduces the light output. Lamps which have become blackened in service should be replaced. The voltage of the lamps should correspond with that in the socket if satisfactory output and performance are desired. Too much stress cannot be laid on these factors.

Numerous tests have shown that a high proportion of the total light generated throughout the country is being wasted through lack of systematic maintenance. A typical case on record might be of interest. In this particular installation, the intensity as found was slightly over 2½-foot candles. Lamps and reflectors were washed, new lamps of the proper voltage were installed, and finally the walls and ceilings were refinished with paint of reflecting power. With no increase in wattage or power consumed, the resultant illumination was over 7-foot candles. It is apparent that this is a matter deserving serious consideration in caring for equipment.

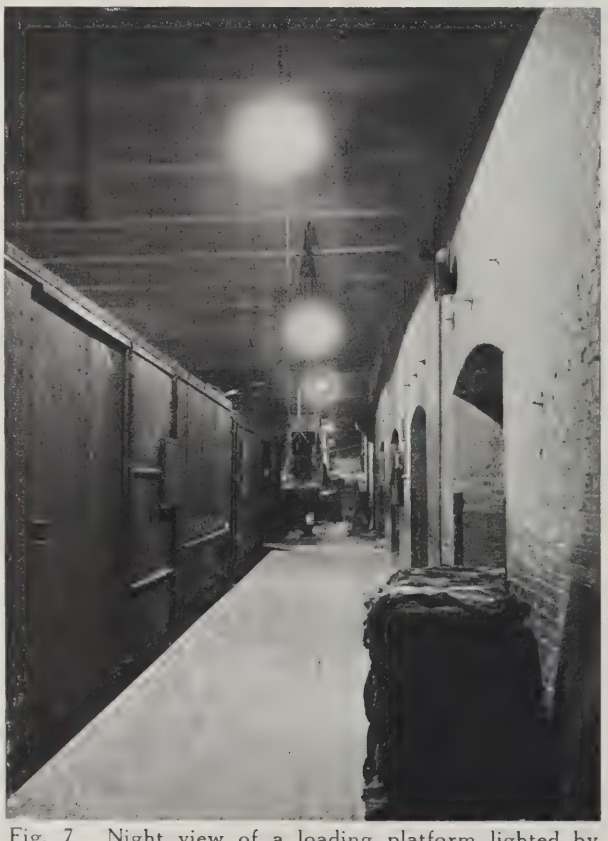
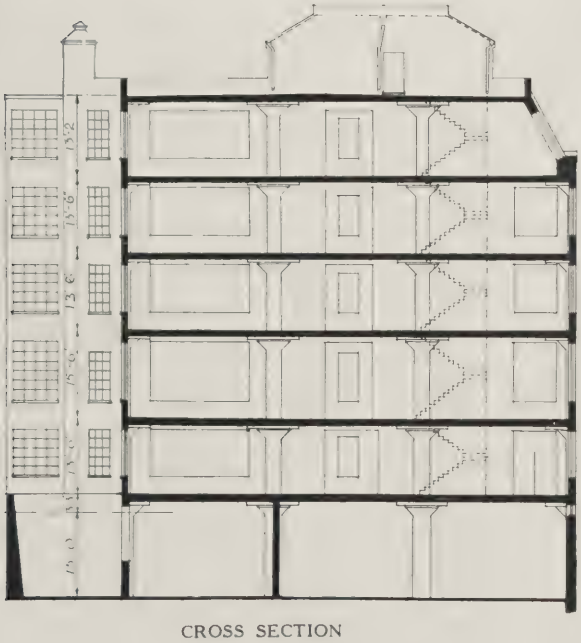


Fig. 7. Night view of a loading platform lighted by 100-watt enameled lamps in standard dome reflectors, 20 feet above floor

PRINCIPAL STREET FRONTAGE



CROSS SECTION

FIRST FLOOR PLAN

Type of construction: Reinforced concrete, flat-slab. Building is planned for live loads of 120 pounds per square foot. All the service requirements, such as elevators, stairs and toilets, are built as towers outside the main structure to reduce corridor space to a minimum.

Exterior materials: Concrete, washed with "Mill White."

Interior materials: Walls plastered; cement floors.

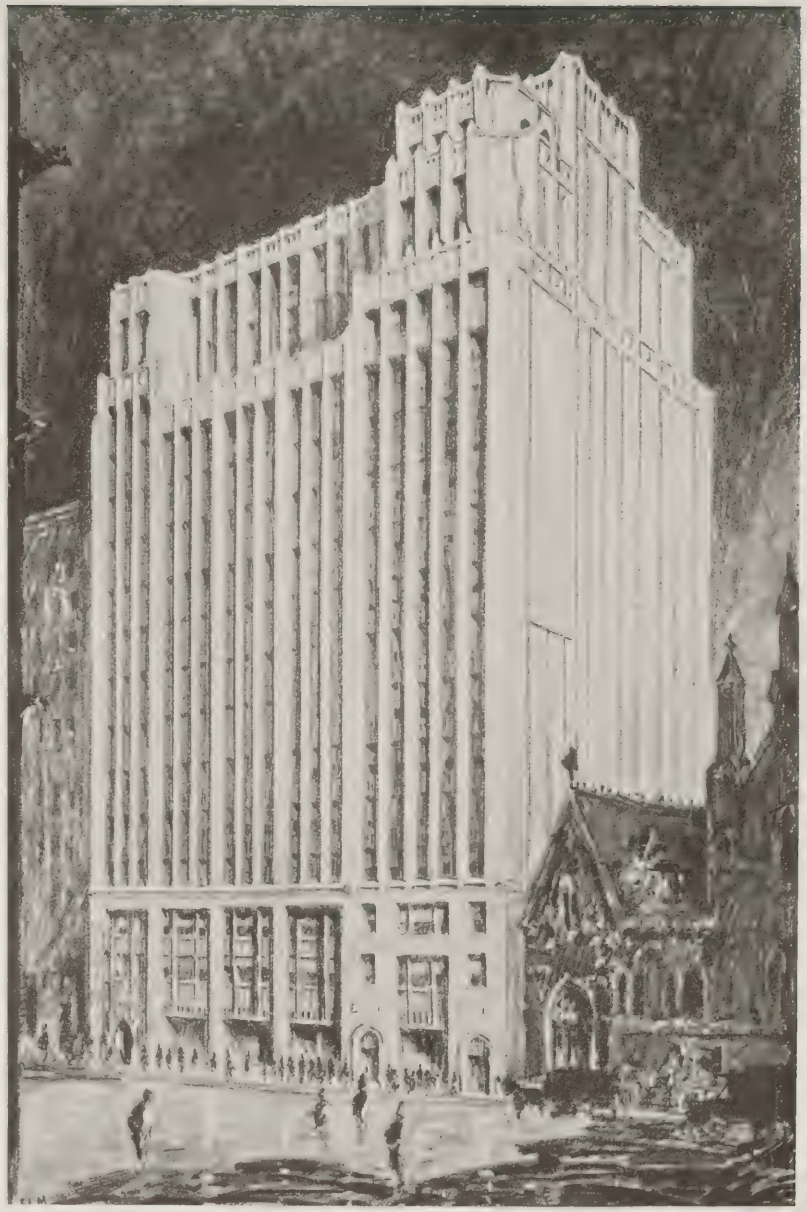
Heating and ventilating: Two-pipe direct gravity steam with pump and receiver. Carrier air conditioning system to provide constant temperature and necessary humidity for a silk-throwing mill.

Windows: Steel sash, pivoted.

MILL BUILDING OF KAHN & FELDMAN, BROOKLYN

BUCHMAN & KAHN, ARCHITECTS

GENERAL EXTERIOR VIEW



PERSPECTIVE OF PRINCIPAL FACADE

GILBERT BUILDING, 205 WEST 39th STREET, NEW YORK

GEO. & EDW. BLUM, ARCHITECTS

GILBERT BUILDING, 205 WEST 39TH STREET, NEW YORK

Illustrations on Plate 53

Type of construction: Skeleton steel frame; curtain walls of brick lined with terra cotta blocks; reinforced concrete floor arches. Floor loads designed for 120 pounds per square foot.

Exterior materials: Lower stories of artificial stone; upper stories of face brick and terra cotta; side walls paneled with face brick in colors.

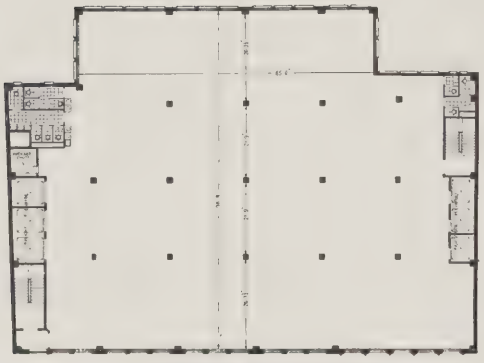
Interior materials: Cement floors; metal partitions in toilets; metal covered doors in steel frames.

Windows: Solid metal sash with wire glass.

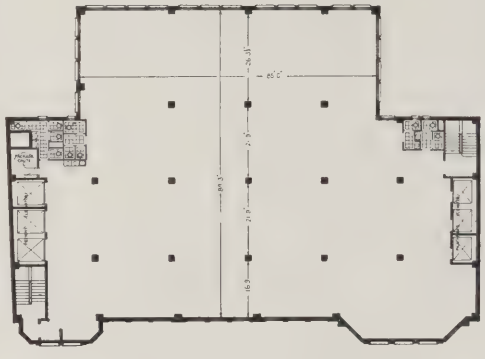
Heating: Steam vacuum system.

Cubic foot cost: 42 cents. Building completed, 1923.

Use of building: Light manufacturing and loft purposes.

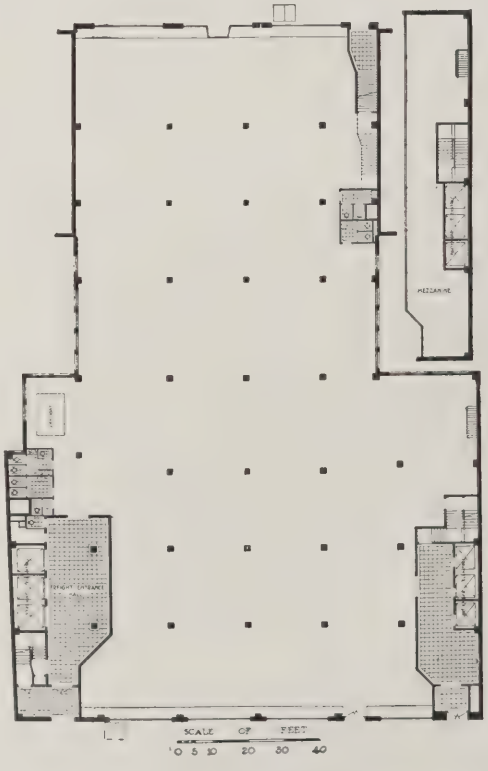


TENTH FLOOR PLAN



FOURTEENTH FLOOR PLAN

BASEMENT FLOOR PLAN



FIRST FLOOR PLAN

DETAIL OF ENTRANCE

GENERAL VIEW OF EXTERIOR

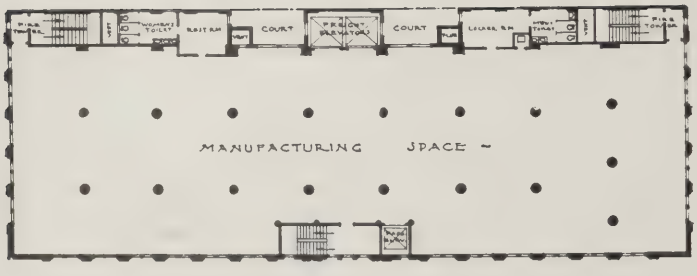
FLETCHER BUILDING, VARICK STREET, NEW YORK

HELMLE & CORBETT, ARCHITECTS

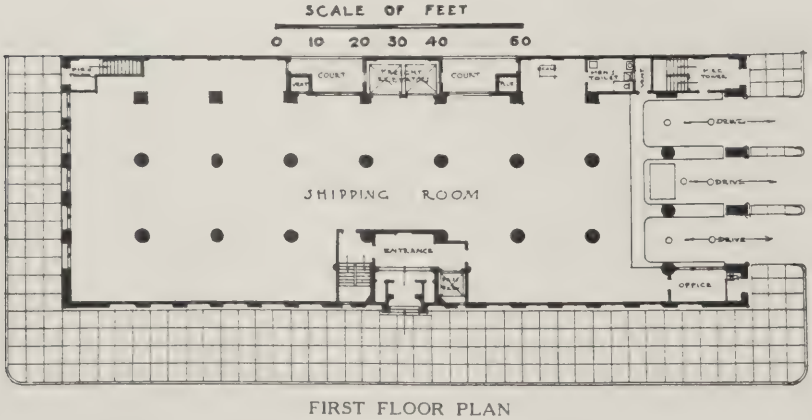
FLETCHER BUILDING, VARICK STREET, NEW YORK

Illustrations on Plate 54

Type of construction: Reinforced concrete; floor loads of 300 pounds per square foot.
Exterior materials: Concrete, with trimmings also of concrete, cast in place.
Floors: Concrete.
Windows: Hollow metal frames and sash.
Lighting: Semi-indirect.
Use of building: Warehouse and manufacturing.



TYPICAL FLOOR PLAN



FIRST FLOOR PLAN

Type of Construction: Reinforced concrete, flat-slab. Floor loads from 125 to 1,000 pounds per square foot. Building includes warehouse, factory, garage and offices.

Exterior materials: Veneer of brick and stone.

Interior materials: Unfinished except office portion. Cement floors, with marble or tile in corridors and toilets.

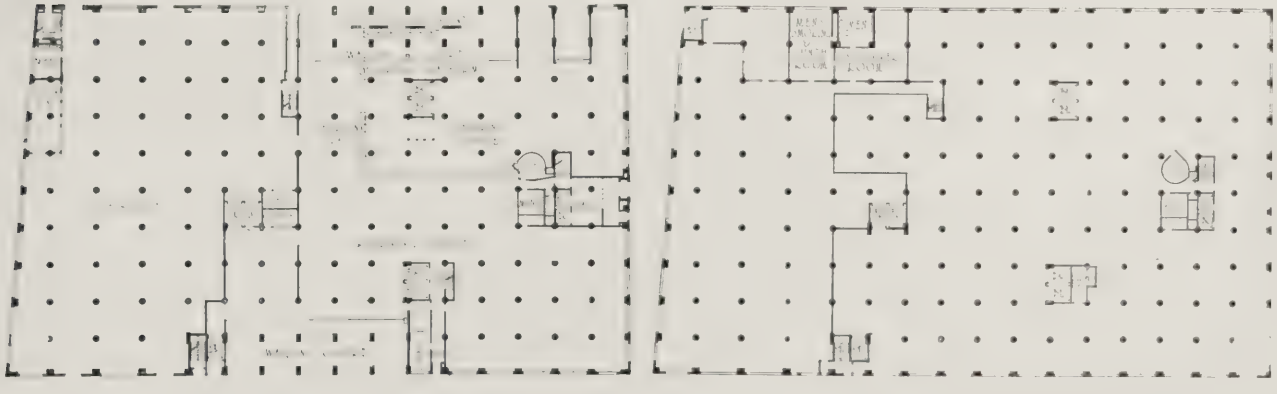
Windows: Steel, factory type sash; double hung sash for office portion.

Heating: Vacuum system.

Date of general contract: May, 1920.

Cubic foot cost: 44 cents.

Use of Building: Warehouse and assembling purposes.



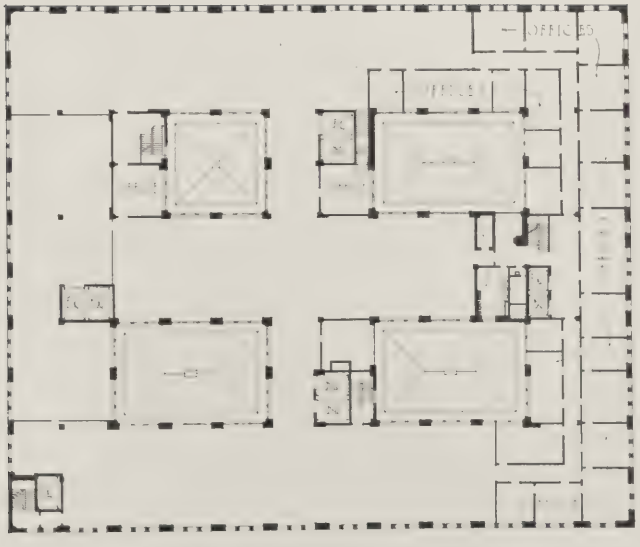
FIRST FLOOR PLAN SECOND FLOOR PLAN

WAREHOUSE, WESTERN ELECTRIC CO., 395 HUDSON STREET, NEW YORK

McKENZIE, VOORHEES & GMELIN, ARCHITECTS

WAREHOUSE, WESTERN ELECTRIC CO.,
395 HUDSON STREET, NEW YORK

Illustrations on Plate 55



NINTH FLOOR PLAN

TENTH FLOOR AND ROOF PLANS

GENERAL EXTERIOR VIEW

DETAIL OF ENDS AT RAILROAD SIDING

Type of construction: Structural steel and concrete; metal sash; 1¼-inch laminated maple floors; partitions: brick or plaster and metal lath; roof: 3-inch plank covered with tar and gravel. Floor loads 125 pounds

Heating: Low pressure steam, with coils and radiators. Ventilating equipment used only over sorting benches. Use: Combined sorting, storage, combing and spinning mill for wool

SPINNING MILL, GOODALL WORSTED COMPANY, SANFORD, MAINE

LOCKWOOD, GREENE & CO., ENGINEERS

Electrical Power in Industrial Buildings

By JAMES A. McHOLLAN

Vice-president, The R. P. Bolton Company, Engineers

THE use of electricity for industrial power purposes is now so general that it is difficult to list the numerous services in which it is successfully used. Practically the only services in the modern building or factory for which electricity is not found to be economical are the heating of buildings, drying of materials and warming of water in large quantities. For all other services, such as the operation of elevators, pumps, compressors, shafting and factory machines of all kinds, electricity is the most economical power to use. It is a serious mistake to use steam engines to operate such machinery, and the use of steam power for such purposes always results in waste of fuel, requires more labor in maintenance, and is less cleanly, convenient and dependable in operation.

In selecting electric machinery it is customary to decide on a voltage and current suitable for operation on the system of the local electric company. This is advisable even if a private plant be installed, as the growth of electrical distribution from central stations is extending so rapidly that it is only a matter of a few years before not only will the private plants in this country be abandoned, but also many of our central stations, except those of the largest size and those in the most suitable locations, will be shut down and their function of power production concentrated in a lesser number of still larger stations, and finally these in turn will become the huge superpower stations which will, in the not distant future, serve the entire country with cheap electric power.

In view of such developments, the engineer who advises his client to engage in the production of electric power should be certain that when a private plant is installed the savings over the cost of purchased power should pay for the cost of the plant in a very few years, and before such a decision is finally reached the whole question should be threshed out between the property owner, his engineer and the local public utility's representative. In former years it was a waste of time to discuss such questions with representatives from the utilities, as it was a common practice for them to submit unreliable statements and estimates of costs which were prepared with the sole purpose of securing contracts for the sale of electricity. It is a pleasure, however, to record the fact that a much broader type of public utility executive is now to be dealt with. The aim is now to present facts and figures in an honest, impartial way, to foster good will and gain the confidence of the public rather than to mislead prospective customers with low estimates of power usage. In past years, the small private plant has served a useful purpose by forcing down the selling price charged by central stations for electric power, and this fact, plus an awakened conscience on the part of the electric companies in dealings with factory owners, makes it generally desirable to consider central station service in preference to a private plant.

These summarized notes of a general nature may be of aid to architects or engineers in selecting electric-driven machinery.

For all electric elevators of up to 400 feet per minute the single-wrap or V-groove drive is the most efficient. Such machines are now manufactured by leading elevator companies. This form of drive requires only one turn of the cables in grooves over the top of the hoisting sheaves. Wear and tear on the cables are reduced, less power is used, and more positive operation and control are secured.

Higher speeds of travel than necessary are often specified for elevator equipment. Where cars stop at every floor or at alternate floors, a speed of more than 250 feet per minute is of doubtful value, as the benefits of full speed of the elevator cannot be obtained in the short distance between stopping and starting points. Higher speeds require larger motors. To keep the speed of the elevator within reasonable limits means lower first cost and greater operating efficiency. Even for passenger elevators, it is a mistake to select cars of over 350 feet per minute unless express service is desired over at least half the traveling distance.

Electric power used by modern electric elevators is not large in terms of kilowatt hours per car mile, as may be seen from the test figures of elevators in a large New York building which are given below.

Where alternating current is used to operate motors of elevators traveling at high speed, that is,

Kilowatt Hours per Car Mile as Determined by Tests of Four Gearless Traction Elevators

	Elevator No. 1			Elevator No. 2			Elevator No. 3			Elevator No. 4		
Week	Car miles	Kw. hrs.	Kw. hrs. per car mile	Car miles	Kw. hrs.	Kw. hrs. per car mile	Car miles	Kw. hrs.	Kw. hrs. per car mile	Car miles	Kw. hrs.	Kw. hrs. per car mile
First	101.0	450	4.46	117.9	390	3.31	132.8	530	3.99	153.8	488	3.17
Second ...	85.4	370	4.33	86.7	300	3.46	110.5	448	4.06	135.0	445	3.29
Third	82.7	360	4.35	114.0	370	3.24	128.0	542	4.24	153.0	484	3.17
Fourth ..	93.5	410	4.39	97.0	400	4.12	128.1	519	4.05	158.4	502	3.17
Fifth	95.3	420	4.39	67.9	400	5.89	127.5	539	4.23	161.6	507	3.14
Sixth	90.0	410	4.55	81.2	390	4.80	131.7	522	3.96	158.7	494	3.11
Total	547.9	2420		564.7	2250		758.6	3100		920.5	2920	
Average			4.42			3.98			4.09			3.17

400 feet per minute and upwards, objection has frequently been raised to noises from vibration, hum and operation of magnets. This has retarded the use of a.c. motors for high-speed elevators, but recently several elevator companies have made improvements in this direction which permit the use of high-speed cars on a.c. systems without undue noise or other objectionable features.

The trend today in electrical systems is definitely toward alternating current. Therefore, select alternating current machinery for all new properties, unless these are to be located in large cities where direct current is in general use. The general advantages of alternating current systems are:

A.c. motors are cheaper than direct-current motors per horsepower.

Commutator troubles, which exist with direct-current motors, are eliminated with a.c. units.

Higher voltages may be used with a.c. system. 440 volts is becoming standard in the larger industrial plants, whereas with direct current 220 volts is the usual limit.

Less copper is used in a.c. feeders with the higher voltage. The cost of copper is therefore less; it also requires less labor for installation.

The chief disadvantage of a.c. systems is loss of power, due to low power factor. There is, however, equipment in the market which can be used to correct this condition.

With a.c. motors the flexibility of speed control is not so great as with direct-current motors. This need only be considered in a few special industrial processes, such as color printing, etc., where the speed control is required to be very delicate.

Centrifugal pumps are to be preferred to plunger pumps. Specify casings of centrifugal pumps to be horizontally split, as this type of casing enables the opening up for inspection and repair of the pump without disturbing the piping connections. Except for pumps which are in continuous service, the use of automatic controls for stopping and starting motors is always advisable. Where two or more pumps operate at one time, the automatic control board should be equipped with a transfer switch so that any one of the pumps can become the leading unit, and thus evenly distribute the wear and tear over all the units in service. Use noiseless check valves on all centrifugal pumps. Several satisfactory types are now on the market.

In operating factory machinery, the individual motor at each machine is to be preferred, although the cost to install is higher than with the group-drive system, which involves fewer motors of a larger size, less wiring and fewer switches. With the individual drive, however, the shut down of one motor means the shut down only of the machine it drives. A failure of a motor on group drive may shut down a number of machines or even an entire department. In overtime work, in many instances, the individual motor is the more efficient.

One disadvantage of the individual motor drive in a.c. systems is a low power factor, but this can be corrected by care in selecting the motors so that they operate at rated load or as near that point as practical. The elimination of overhead shafting, pulleys, belts, bearings, etc., which is effected with the individual drive system, greatly improves the working conditions in factories.

The enclosed type electric-driven compression machine is preferable to the absorption type of ice machine which is often used where a cheap and abundant supply of water is available. The compression plants, however, are more simple in opera tion, have fewer parts, take up less space, and are more generally used. The use of cooling towers, by means of which the condenser water can be cooled by contact with the air and re-used, reduces the cost of water, and wherever water has to be purchased the investment is always justifiable.

Compressors driven by electric motors by means of belt or chain drive are in general use. With small compressor units a gear drive is satisfactory. Automatic controls to stop and start the motors to maintain the desired air pressure should always be used. Where several units operate together to supply one service, a transfer switch on the controls should be provided.

Whether electricity is purchased or produced, the importance of measuring the electricity used by departments, groups of machines, or individual machines cannot be overestimated. Electric meters check accurately the amount of electric power used and its distribution throughout a plant. It is an aid to intelligent costkeeping and important, therefore, in every installation. The upkeep and maintenance of the meters are low; testing and calibrating are required about once per year.

When private power plants are installed to produce electric power, condensing turbines are the most efficient units to use. If any of the exhaust steam is to be used, the conditions as to back pressure, amount to be used, etc., should be carefully explained to the turbine manufacturers before machinery is selected and ordered.

In reciprocating engines there are types now manufactured which show a remarkably low steam consumption per horsepower. These engines also show a high efficiency under light or variable loads, a condition quite common in power-plant operation.

All auxiliary machinery in and around the engine room and boiler room of the power plant should be electrically operated. Reciprocating steam pumps or small steam turbine pumps, in the writer's opinion, should not be considered in a modern installation. The only exception should be a power plant where operation is intermittent.

The manufacture of electric machinery is becoming highly specialized, and manufacturers are concentrating more and more on producing fewer lines of equipment, and in gathering and distributing the most detailed information regarding their products.

Data on Fire and Accident Prevention Requirements

By C. STANLEY TAYLOR

THE purpose of this article is to provide complete reference data covering all important sources of dependable information regarding safeguarding against fire through the proper construction and equipment of industrial buildings, and those phases of accident prevention which should be had in mind in preparing the plans for such buildings. There will be found here a brief description of each source of such information, together with a reference to publications and data available. There is also presented a list of reference books which completely cover this subject.

When plans and specifications for an industrial building are being developed it is quite important that full information be obtained as to standards and requirements of insurance companies. If plans are developed in accordance with these requirements the result will mean not only a low rating and its accompanying low insurance costs, but will also introduce a high degree of safety, which protects the owner against the great indirect loss which he must suffer if an industrial building is burned and production crippled or stopped entirely.

Through the efforts of the fire insurance fraternity, a number of advisory organizations have been developed, each of which is briefly described in these paragraphs.

National Board of Fire Underwriters. This is an organization maintained by about 140 of the leading fire insurance companies for the purpose of research as to the causes of fire and for provision of standards and advisory service to aid in reducing fire losses by encouraging proper construction and equipment of buildings of every type. The headquarters of this association is 76 William street, New York, and architects may obtain any type of information on the subject of insurance engineering through this source. In co-operation with the National Fire Protection Association, the National Board of Fire Underwriters has developed in printed form a large number of standards and reference data covering practically all phases of fire prevention and protection. A number of these will be found listed under publications available through the National Fire Protection Association.

National Fire Protection Association. An organization maintained by a large number of insurance companies, by national institutes, societies and associations interested in the protection of life and property against loss by fire, and by individuals and corporations similarly interested. The purpose of the association is twofold: First, to formulate standards under which fire waste may be checked; the other, to educate the public in observing these standards and to point out the economic losses due to fire waste. This is a valuable source of information for the architect, and here will be found a partial list of reference publications which are available through this organization.

"Recommended Building Code" (National Board of Fire Underwriters).
This extensive publication presents practical requirements covering mill construction and other types of industrial buildings.

"Blower Systems."
For heating and ventilating, stock and refuse conveying.

"Dip Tanks."
Hardening and tempering tanks, flow coat work, spray booths, japanning and enameling, including ovens, foam extinguisher systems.

"Electric Wiring and Apparatus" (National Electrical Code).

"Electrical Fittings."
List of approved.

"Fire Pumps."
Steam.

"Fire Pumps."
Rotary and centrifugal, and electrical and gasolene engine driving of fire pumps.

"Oil-Burning Equipment."

"Hose Houses."
For mill yards, construction and equipment.

"Lightning."
Suggestions for protection against lightning.

"Protection of Openings."
In walls and partitions.

"Roof Openings."
Cornices and gutters.

"Sprinkler Equipment."
Automatic and open systems.

"Steam Pump Governors and Auxiliary Pumps."

"Tanks."
Gravity and pressure, concrete reservoirs and valve pits.

"Vaults."

"Standpipe and Hose Systems."

"Mill."
Slow-burning building construction, including scuppers.

"Valves."
Controlling water supplies for fire protection.

"First Aid Fire Appliances."
Installation, maintenance and use of.

Other publications issued by this organization and of interest in connection with the planning of factory buildings include:

"Field Practice—An Inspection Manual."
A practical handbook, representing the latest thought of the leading American fire prevention engineers.

"Safeguarding Factory Workers from Fire."
Rules for measuring exit capacities and determining permissible numbers of occupants.

"Fire Exits, Outside Stairs for."
Recommendations for their construction and installation.

"Exit Drills for Factories, Schools, Department Stores and Theaters."
Suggestions for their organization and execution.

"Roof Coverings and Their Fire-Resisting Properties."
"Water Distribution Systems and Protection."
By George W. Booth.
"Flow Capacity of Water Pipes."
By C. F. Wagner.
"Fire Pumps."
Notes and suggestions. Associated Factory Mutual Fire Insurance Companies. Booklet, 53 pages.
"Elevated Tanks."
By W. O. Teague. 23 pages.
Their improved design and construction.
"Factories and Their Fire Protection."
By Franklin H. Wentworth.
"Mill Construction Buildings."
By C. E. Paul
"Color, Paint and Varnish Factories."
By F. E. Roberts. 31 pages.
Processes and hazards.
"Shoe Factories."
Suggestions for their improvement as fire risks. Committee report.
"Cold Storage Warehouses."
Suggestions for their improvement as fire risks. Committee report.
"Refrigerating Machinery Explosions and Fires."

In addition to the publications indicated, a large volume of information has been developed by the association and is recorded in its *Proceedings*. Architects interested in any phase of fire prevention or protection are advised to write the National Fire Protection Association to obtain all available information on the particular subjects of interest.

Underwriters' Laboratories. An experimental station supported primarily by the National Board of Fire Underwriters for the purpose of reporting on the fire retardant and fire resistive qualities of all types of building materials, and the merits of appliances, devices and machines bearing on fire and accident dangers. A system of labeling has been developed by this organization by which materials and equipment which have been inspected by the underwriters may be immediately recognized and classified. Through this organization architects may obtain lists of inspected materials and devices which meet with the approval of insurance companies in accordance with the recommendations of the Underwriters' Laboratories. The purpose and accomplishments of this organization have been admirably set forth in a recent book entitled "A Symbol of Safety," by Harry Chase Brearley. This volume contains not only a complete description of the work of the laboratories but also some very valuable information on increasing the factor of safety in building construction.

Associated Factory Mutual Fire Insurance Companies. A large proportion of industrial fire insurance is covered directly through the Mutual Fire Insurance Company, which, through an extended study of the fire hazard in industrial buildings, has been able to reduce greatly the fire losses in this type of construction. An organization known as the Associated Factory Mutual Fire Insurance Companies is located in Boston, where an extensive laboratory has been maintained for a number of years for the purpose of studying fire protection devices and fire insurance engineering. A number of charts and publications have been issued by this organization, and the architect will find these of particular value in the designing of factory buildings. He will find here also a source of information covering any individual problem which may develop in his plans.

Another source of information of similar character is the Factory Insurance Association of Hartford, engineering service by insurance brokers. It is important for the architect to know that a number of the larger insurance brokers and companies maintain special engineering departments which have had particular experience in the checking of plans and recommended equipping of buildings to develop a high degree of safety against fire, and a resultant low insurance rate. This service is available to building owners usually without charge, provided the insurance policy is handled through the company or organization which provides this service. An architect may arrange with his client to submit plans to such an organization, and this advisory co-operation will be found invaluable before and after construction and in the process of establishing insurance rates. It will also be found that similar co-operation can be obtained through local insurance inspection bureaus and local agents of large fire insurance companies.

Important Reference Books

"Handbook of Fire Protection" (Crosby-Fiske-Forster).
This is a complete handbook of valuable reference data covering every phase of fire protection engineering, and providing all necessary technical information which the architect may need for incorporation in his plans.
"Fire Prevention and Fire Protection (Joseph Kendall Freitag).
A most complete handbook of theory and practice on fire prevention and protection as applied to building construction of every type. The handbook contains over 1,000 pages, and covers in detail all elements of insurance engineering, including planning, equipment and maintenance of buildings from the viewpoint of fire prevention.
"Automatic Sprinkler Protection" (Gorham Dana).
A complete treatise on the subject of automatic sprinkler equipment, giving full details as to all types of equipment together with proper methods of installation and maintenance. It is interesting to note in this connection that any information required in regard to the use of automatic sprinklers may be obtained through the service of the National Automatic Sprinkler Association, 80 Maiden lane, New York.

In another article in this issue of THE FORUM the importance of careful consideration by the architect of this question of fire prevention and protection is presented in greater detail, and through the sources outlined in preceding paragraphs the architect is offered full co-operation and provision of complete information on any phase of this subject.

Checking Plans and Specifications for Safety

How to check plans and specifications for safety is told in a pamphlet just issued by the National Safety Council, 168 North Michigan avenue, Chicago, containing a check list of several hundred items which must be considered if serious hazards are to be avoided. The pamphlet, which has been prepared under the supervision of the council's Safe Practices Committee of 75 safety engineers, points out that if proper precautions are taken when drawing plans and specifications for new buildings or equipment, many accident hazards can be forestalled—an important matter to the plant engineer in these days of increasing pressure from government and insurance inspectors, compensation laws, and plant safety departments. Such engineering revision—or pre-vision—it is said, removes at little or no cost hazards which later could be corrected only at heavy expense if at all, and insures compliance with both government and insurance demands, the latter resulting in premium reduction. Under "General Plant Layout" are mentioned such items as the use of natural topography to eliminate dangerous grade crossings and unnecessary elevating of material with the attending hazards; proper drainage; proper location of drinking-water wells; smokestacks; buildings with serious fire or explosion hazards, etc. Attention is called to the necessity of considering the entire design in the light of future extension of the plant, increase in height of buildings, or changes in their industrial uses.

Other sections list the items requiring attention in connection with railroads, roadways for vehicles, and footways. Fences, intended for plant protection, may introduce accident and fire hazards if not properly designed, and these are next considered, followed by a section on pipe lines for water, steam, oil, gas, chemicals, etc. Some 30 items in connection with the general design of buildings are listed, and a number dealing with heating and ventilation, lighting, and toilets, washrooms, etc. The remaining sections are devoted to power supply, both steam and electric; elevators; cranes, derricks and hoists; conveyers; mechanical power transmissions; exhaust systems; abrasive wheels, and shop layout and machinery such as are found in a typical manufacturing shop. The list concludes with a section covering the special hazards of a chemical plant or department, this being presented as typical of the special check list which each engineer should develop for his own special industry.

For detailed information on each of the points covered, the engineer or architect is referred to various standards and handbooks, including the Engineering Standards Committee publications, the "Safe Practices" pamphlets, and other publications of the National Safety Council.

Prices and information concerning any of the publications mentioned here may be obtained through THE ARCHITECTURAL FORUM Book Department.

Detail of Corner Pylon, Siege Building, U. S. Arsenal, Rock Island, Ill. Reinforced concrete construction with architectural features of concrete cast in place. The main facade is 600 feet long

Bigelow & Wadsworth, Consulting Architects; Stone & Webster, Inc., Engineers

EDITORIAL COMMENT

ARCHITECTURE AND INDUSTRY

ART finds its inspiration everywhere. The record of artistic progress and development constitutes a graphic outline of the history of mankind. Christianity and idolatry, imperialism and patriotism, luxurious indulgence and frugal industry—every passion or prejudice of each generation since the dawn of history has contributed its impulse and left its imprint of artistic expression.

Industry has at all times been a prolific source of artistic inspiration. Like war and religion, it has found primary expression in a pictured history of all peoples and races. Artist-historians of the Nile valley, in ideal graphic presentation, recorded the industries of ancient Egypt. The publicists of the Chang period, through pictographic inspiration, encouraged and promulgated agriculture and kindred industries through a vast empire, and at the same time formulated the basis of the magnificent, patient art of China. So from the records of aboriginal peoples to the complex methods of artistic expression of the present day we find a close kindred relationship between art and industry. At times industry is the inspiration of art, and again art inspires industry.

As we consider the development of architecture in the United States, one interesting phase is the possibility of developing originality in design and expression. We are inclined to believe that there can be no really original architecture until we consider the somewhat paradoxical possibility of an important contribution to the development of American architecture through the medium of designing industrial buildings.

Should we examine those historical periods from which most of our precedent in architectural design is drawn today, we would find that perhaps factories are the only general class of buildings which were not in use during those centuries long passed. Until the development of our modern methods of transportation and communication, industry found its place in the homes of the people, and it has been only in comparatively recent years that the idea of industrial production at centralized points and in special types of buildings has been developed. The first actual factory building (probably developed in England) consisted merely of open sheds to afford covering against sunlight and rain, and in which the people of the village would gather to weave, spin, carve and perform the various offices of craftsmanship which flourished during that period. After the introduction of complicated machinery it became necessary to give more thought to the buildings in which this machinery and the necessary operatives were installed. Gradually the factory developed, usually in close proximity to congested residential districts, and ultimately it formed the nucleus of the manufacturing city or town.

During the early period of development of factory buildings very little attention was paid to any but the most practical consideration of providing a building within which the machinery and workers might be protected from the elements. After a brief period, however, the unhealthful conditions of factory workers caused an alarming and vital deterioration among the working classes due to long hours spent in poorly lighted and unsanitary buildings. It was realized also that the efficiency of production was greatly hampered, and as a result the design of factory buildings became of a more studied nature, in which, however, the æsthetic factor received no consideration. Within recent years a new element has been introduced in the design of industrial buildings, calling for a degree of artistic expression. Several conditions have contributed to this increasing demand for good architecture in the housing of industry. One of these has been institutional pride, which recognized the advertising value of a well designed manufacturing plant. Another has been the practical recognition of increased efficiency on the part of employes where sanitary and attractive working conditions prevail.

The spirit of community betterment is more and more aggressively protesting against the unsightliness of industrial plants. This growing consideration of atmosphere as a factor in the development of industrial projects presents an unusual opportunity for the architect to display originality in the planning and treatment of such buildings.

In an interesting article in this issue Cass Gilbert makes several constructive observations which bear out this contention. He believes logically that there is no reason why our industrial buildings should be ugly in order to be useful. He suggests that the materials commonly used for factory buildings, such as concrete and brick, offer interesting possibilities, many as yet untried, and that modern methods of factory construction present many opportunities of building carefully disposed masses of studied outline, striving for the benefits of simplicity, of surface colorings and textures at once satisfying and economical.

The great outstanding promise that industrial building holds for the profession is the opportunity of creating a style of architecture that will truly interpret modern conditions. Without precedent to fetter the hand of the designer, the simple requirements of industrial buildings should suggest appropriate forms that may eventually lead the way to the long sought American style.

The Hampton Exhibits occupy this entire building. No branches or associated companies.

A Paneled Living Room at the Hampton Shops

THERE is a dignity and charm in this green and gold paneled room brought from an XVIII Century English house and installed in the Hampton exhibits. It forms a delightfully restful background for this beautifully shaped, hand carved English sofa, grouped with the comfortable, low wing chair and the convenient cabinet-desk of black and gold lacquer.

This is but one of the many livable interiors arranged with harmonious furnishings by the Hampton Decorators to assist you in visualizing your own home. Here you will find a vast collection of antiques from Italy, France and England, hand made reproductions and adaptations, and also the able assistance of the Hampton Decorators who are equipped to plan and carry out your interiors in every detail.

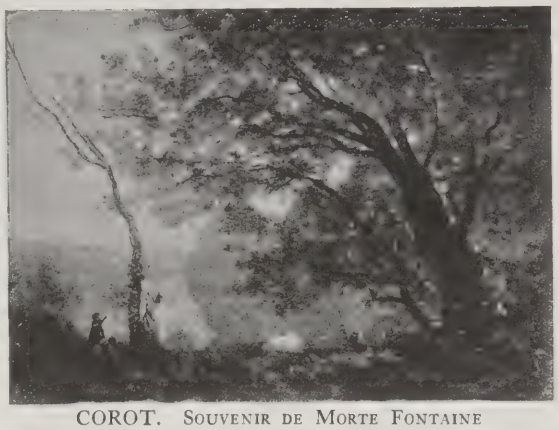
Hampton Shops

18 East 50th Street
Facing St. Patrick's Cathedral
New York

Decoration · Antiquities · Furniture

"Of all God's gifts to the sight of man, colour is the holiest, the most divine, the most solemn. The purest and most thoughtful minds are those which love colour the most."

John Ruskin



COROT. SOUVENIR DE MORTE FONTAINE
(Louvre)
Size of colour surface, 15¾ x 22¼ inches
Price, $7.50

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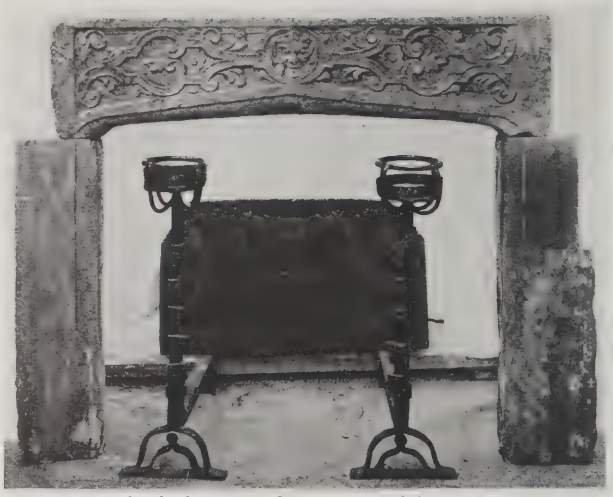

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Selected List of Manufacturers' Literature

FOR THE SERVICE OF ARCHITECTS, ENGINEERS, DECORATORS, AND CONTRACTORS

The publications listed in these columns are the most important of those issued by leading manufacturers identified with the building industry. They may be had without charge, unless otherwise noted, by applying on your business stationery to *The Architectural Forum*, 383 Madison Ave., New York, or the manufacturer direct, in which case kindly mention this publication.

ACOUSTICS

Johns-Manville, Inc., Madison Ave. & 41st St., New York, N. Y.
Architectural Acoustics. Booklet. 6 x 9 in. 24 pp. Illustrated. Treatise on the correction of architectural acoustics in churches, schools, hospitals, office buildings and other places.

ASH HOISTS—ELECTRIC AND HAND POWER

Gillis & Geoghegan, 544 West Broadway, New York, N. Y.
General Catalog. 8½ x 11 in. 20 pp. Fullly illustrated. Contains specifications in two forms (with manufacturer's name and without). Detail ¼" scale for each telescopic model and special material-handling section.
The Man-Saving Load Lifter, 5⅞ x 8⅞ in. 8 pp. Illustrated. Describes G&G Telescopic and Non-Telescopic Hoists for handling material in factories.

BATHROOM ACCESSORIES

The Fairfacts Company, 234 West 14th St., New York, N. Y.
Catalog F. 4 x 9 in. 12 pp. Illustrated. Describes full line of china fittings for bathrooms.
The Perfect Bathroom. Booklet. 4 x 9 in. 12 pp. Illustrated. Shows full line, Biltin and Projecting Types, installed. For architects and clients.

BOILERS—See Heating Equipment

BRICK

American Face Brick Association, 1751 Peoples Life Bldg., Chicago, Ill.
The story of Brick. Third Edition. Booklet. 7 x 9¼ in. 55 pp. Illustrated. Presents the merits of face-brick from structural and artistic standpoints. Tables of comparative costs.
The Home of Beauty. Fourth Edition. Book. 8 x 10 in. 72 pp. Color plates. Presents fifty designs for small face-brick houses submitted in national competition by architects. Text by Aymar Embury II, Architect. Price 50c.
Bungalow and small house plans. Booklets. 8½ x 11 in. 50 pp. Illustrated. Four booklets, showing a variety of designs for small face-brick houses, covering 3, 4, 5, 6, 7 and 8 room houses. Price, 25c. each, $1 for the set.
A Manual of Face-Brick Construction. Booklet. 8½ x 11 in. Textbook on construction of the brick wall and various uses of face brick. 31 colored plates of brick houses with plans. Price, $1.00.
Architectural Details in Brickwork. Series 1, 2, 3. 8½ x 11 in. Very useful to the architect or draftsman. Sent free to architects applying on their office stationery. To others $1.50.

B. Miffin Hood Brick Co., Atlanta, Ga.
Burned Clay Products. Booklet. 9½ x 12½ in. 47 pp. Illustrated. Shows different uses of brick, but presents particularly the various uses of quarrie floor tile. Free to architects and engineers.

BUILDING FINANCE

S. W. Straus & Co., 565 Fifth Ave., New York, N. Y.
The Straus Plan of Financing. Booklet. 8 x 6 in. 24 pp. Illustrated. Describes Straus system of co-operating with Architects, Builders, Engineers and Brokers in financing important building operations; also the making of construction loans on larger and better properties in our large cities.
Forty-one Years Without Loss to Any Investor. Booklet. 8 x 5 in. 38 pp. Illustrated. A carefully prepared booklet for the thinking investor. Describes Straus bonds, the property upon which loans are made, and explains the Straus plan of safeguards which made possible the 41-year record.

BUILDING STONE—See Stone, Building

BUILDING, STANDARD STEEL

Truscon Steel Company, 250 W. Lafayette Blvd., Detroit, Mich.
Truscon Standard Building Catalog. 8½ x 11 in. 48 pp. Contains data and illustrations.

BUILDING, STEEL PRODUCTS FOR

Truscon Steel Company, 250 W. Lafayette Blvd., Detroit, Mich.
Truscon Data Book. Catalog. 3½ x 6 in. 128 pp. Illustrated. Contains complete information with illustrations on Truscon reinforcing steel, steel windows, metal lath, standard buildings, concrete inserts, steel joists, pressed steel stamping and chemical products.

CEMENT

Carney Company, The, Mankato, Minn. Booklet. 8 x 10 in. 24 pp. Illustrated. Complete information on product, showing prominent buildings in which this cement has been used.

Louisville Cement Co., 315 Guthrie St., Louisville, Ky.
Brixment. Booklet. 7½ x 5 in. 16 pp. Illustrated. Brixment, what it is, what it does, how it does it and why.

Sandusky Cement Co., Dept. F, Cleveland, Ohio.
Medusa Waterproof White Portland Cement. Booklet. 8½ x 11 in. 32 pp. Illustrated.
Medusa Integral Waterproofing Powder and Paste. Booklet. 8½ x 11 in. 88 pp. and cover.

CONDUIT

National Metal Molding Co., 1113 Fulton Building, Pittsburgh, Pa.
Bulletin of all National Metal Molding Products. In correspondence folder. 9½ x 11½ in.
Sheraduct. Circular. 5 x 8 in. Illustrated.
Flexsteel. Circular. 5 x 8 in. Illustrated.

CONSTRUCTION, FIREPROOF

National Fire Proofing Co., 250 Federal St., Pittsburgh, Pa.
Standard Fire Proofing Bulletin 171. 8½ x 11 in. 32 pp. Illustrated. A treatise on fire proof floor construction.

Northwestern Expanded Metal Co., 934 Old Colony Building, Chicago, Ill.
Fireproof Construction Catalog, 6 x 9 in. 72 pp. Illustrated. Handbook of practical suggestions for architects and contractors. Describing Nemeo Expanded Metal Lath.

CONSTRUCTION, FIREPROOF—Continued

Fireproof Construction. Catalog. 6 x 9 in. 72 pp. Illustrated. Describing Kno-Burn expanded metal lath.

DAMPPROOFING

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York.
Specification Sheet. 8½ x 11 in. Descriptions and specifications of compounds for dampproofing interior and exterior surfaces.

DECORATIVE TILES

The Rookwood Pottery Company, Cincinnati, Ohio.
Halftone reproductions and photographic prints showing various tile treatments. 9½ x 11½ in.

DOORS AND TRIM, METAL

The American Brass Company, Waterbury, Conn.
Illustrated pamphlet describing use and adaptability of Extruded Architectural Bronze Shapes for metal window frames, doors, grilles, counter screens, etc.

The Compound & Pyrono Door Company, St. Joseph, Mich.
Pyrono Handbook for Architects and Contractors. 8½ x 11 in. 16 pp. Contains full information regarding Pyrono Fireproof Veneered Doors and Trim, with complete details and specifications.
Pyrono details in sheet form for tracing.

Dahlstrom Metallic Door Company, 425 Buffalo Street, Jamestown, N. Y.
Architectural Catalog. 10 x 14 in. 46 pp. 11 sections. Illustrated. Catalog showing our regular styles and types of hollow metal doors and interior trim. Various types of frames and other architectural shapes also illustrated.
Architectural Portfolio. 14 x 18 in. 30 pp. Illustrated. Portfolio of various designs and types of Dahlstrom doors. Drawings and details of each style of type. This is only sent free to reliable architects.

Richards-Wilson Mfg. Co., Aurora, Ill.
Fire Doors and Hardware. Booklet. 8½ x 11 in. 64 pp. Illustrated. Describes entire line of tin-clad and corrugated fire-doors, complete with automatic closers, track hangers and all the latest equipment—all approved and labeled by Underwriters' Laboratories.

The J. G. Wilson Corporation, 8 West 40th St., New York, N. Y.
Rolling Doors and Shutters. Book. 8½ x 11¾ in. 80 pp. Illustrated. A handbook for engineers and architects, showing details, dimensions and photographs of installations.
Doors for Industrial Buildings. Booklet. 8½ x 11 in. 16 pp. Illustrated. Data covering different types of doors made for industrial structures.

DRAFTING MATERIALS

American Lead Pencil Company, 220 Fifth Ave., New York, N. Y.
VENUS Pencil in Mechanical Drafting. Booklet C20. 6 x 9 in. 16 pp. Illustrated. Describes the many possibilities of the VENUS for technical drawing.
Catalog. 3¾ x 8¾ in. 25 pp. Illustrated. Describes pencils, holders, erasers, etc.

DUMBWAITERS

Kaestner & Hecht Co., Chicago, Ill.
Bulletin 520. Describes K. & H. Co. electric dumbwaiters. 8 pp.

Sedgwick Machine Works, 151 West 15th Street, New York.
Catalog and Service Sheets. Standard specifications, plans and prices for various types, etc. 4¼ x 8¼ in. 60 pp. Illustrated.

ELECTRICAL EQUIPMENT

Arrow Electric Co., Hartford, Conn.
Catalog 5½ x 7½ in. 160 pp. Illustrated. Treats of parts of every kind used in electrical wiring.

Connecticut Electric Mfg. Co., Bridgeport, Conn.
Up-to-date Electrical Specialties Pocket Catalog. 3 x 4¾ in. 305 pp. Illustrated. Gives size, weight, prices and data for sockets, receptacles, rosettes, switches, cut-outs and other wiring devices.
Connecticut Toggles Switches Folder. 3½ x 6½ in. 4 pp. Illustrated. Describes latest idea in electric switch and gives list price, catalog numbers and schedules.
Connecticut Sockets. Folder. 3½ x 6½ in. 6 pp. Illustrated. Describes Key-Keyless and Push Button Sockets and gives prices and catalog numbers.

Frink, Inc., I. P., 24th Street and 10th Avenue, New York, N. Y.
Catalog 415. 8½ x 11 in. 46 pp. Photographs and scaled cross-sections. Specialized bank lighting, screen and partition reflectors, double and single desk reflectors and Polaralite Signs.

General Electric Company, Schenectady, N. Y.
Wires and Cables. Booklet. 8 x 10½ in. 85 pp. Illustrated. Four Bulletins in a binder, describing wires and cables in general, conductor insulated with vulcanized rubber compound, varnished cambre and paper insulated cables, splicing materials and junction boxes for cable installations, armored cables.
Electric Fans. Folder. 6 pp. 3¼ x 6 in. Illustrated. Describes 1922 line of electric fans, giving catalog numbers, voltages and frequencies.
Reliable Wiring Devices. Catalog. 3 x 4⅝ in. 206 pp. Illustrated. Pocket catalog giving prices, schedule classifications and data for socket receptacles, switches, rosettes, cutouts and fuses for miscellaneous devices.
Lighting of Public Buildings. Bulletin. 6 x 9 in. 25 pp. Illustrated. Describes lighting of galleries, banks, museums, libraries, municipal, county and state buildings.

Hart & Hegeman Mfg. Co., 342 Capitol Ave., Hartford, Conn.
A new H & H Switch. Leaflet. 3½ x 6 in. 4 pp. Illustrated. Illustrates a new H & H composition base push switch of De Luxe quality.
Tumbler Switches. Booklet. 3½ x 6 in. 6 pp. Illustrated. Shows complete line of H & H Tumbler Switches.

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 69*

ELECTRICAL EQUIPMENT—Continued

H & H Elexits. Booklet. 8 x 10¼ in. Illustrated. Shows new complete line of Elexits—places for lights. May be used for Wall Receptacles or Electric Fixtures.

H & H Radio Button Push Switches. Booklet. 3½ x 6 in. Illustrated. Radio Luminous Buttons applied to Push Switches and Sockets.

The Holtzer-Cabot Electric Co., Amory St., Boston 19, Mass.

Signaling Systems for Hospitals. Brochure. 8½ x 11 in. 42 pp. Illustrated. Contains complete data covering Nurse's Call, Doctor's Call, "In" and "Out," Fire Alarm, Watchman's Clock and Telephone Systems.

Signaling Systems for Schools. Brochure. 8½ x 11 in. 47 pp. Illustrated. Contains complete data covering Telephone Systems, Program Bells, Fire-Alarm Systems, Low Tension Power Plant and Laboratory Equipment.

Kohler Co., Kohler, Wis.

Kohler Automatic Power and Light 110 Volt D. C. Booklet. 5 x 7 in. 32 pp. Illustrated. Describes a standard voltage automatic, electric power and light plant for isolated homes.

Simplex Wire & Cable Co., 201 Devonshire Street, Boston, Mass.

Simplex Manual Catalog and reference book. 6¾ x 4¼ in. 92 pp. Contains in addition to information regarding Simplex products, tables and data for the ready reference of architects, electrical engineers and contractors.

Specification No. 2053. For Simcore Wires and Cables. Various sizes of Conductor-Rubber Insulation.

Standard Electric Time Co., Springfield, Mass.

Catalog of Standard Electric Time Systems. No. 35. 8¾ x 6 in. 58 pp. Illustrated. Shows all types of Standard Electric Time Devices, with full information about mechanism, construction, design and installation.

School Booklet. 8⅛ x 11 in. 8 pp. Illustrated. Describes completely the use of Standard Electric Time, Program and Signal Systems in schools. References included.

Industrial Booklet. 8⅛ x 11 in. 12 pp. Illustrated. Describes use of Standard Electric equipment in industrial establishments, with references.

Data Folder for Architects. 8½ x 11 in. Illustrated. Looseleaf folder, to be added to from time to time, giving specifications and wiring diagrams and other useful data.

Varnum Door Engine Company, 949 West 16th St., Los Angeles, Calif.

Varnum Electric Door Engines. Booklet. 5 x 7¾ in. 16 pp. Illustrated. Descriptive booklet containing illustrations and list of representative institutions now using Varnum Door Engines.

Western Electric Co., 195 Broadway, New York, N. Y.

Western Electric Inter-Phones for Apartment Houses. Booklet. 5¼ x 6¾ in. 16 pp. Illustrated. Illustrates and describes use of Inter-Phones in Apartment Houses.

Installing and Maintaining Western Electric Inter-Phones in addition to giving general information on layout of systems; details are supplied on individual Inter-Phone Systems, listing battery and wiring requirements.

Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa.

Safety Switches. Folder F-4434 B. 3½ x 6 in. 2 pp. The 100 per cent Safe Service Entrance Switch.

Meter Service Switches. Booklet. F-4484. 3½ x 6 in. 16 pp.

Panel Boards. Catalog 22A. 8½ x 11 in. 16 pp. Illustrated.

What Fans Are For. Booklet F-4520. 3½ x 6 in. 16 pp. Illustrated in color.

ELEVATORS

Kaestner & Hecht Co., Chicago, Ill.

Bulletin 500. Contains 32 pp. Giving general information on passenger elevators for high buildings.

Bulletin 530. Interlocks for Passenger and Freight Elevators.

Bulletin. Signals for Passenger and Freight Elevators.

Otis Elevator Company, 11th Ave. & 26th Street, New York, N. Y.

Otis Push Button Controlled Elevators. Booklet. 6 x 9 in. 56 pp. Illustrated. Detailed description of Otis Push Button Elevators. Their uses in residences, stores, institutions, apartment houses, business offices and banks, etc.

Otis Geared and Gearless Traction Elevators of All Types. Descriptive leaflets. 8½ x 11 in. Illustrated. Full details of machines, motors and controllers for these types.

Escalators. Booklet. 8½ x 11 in. 22 pp. Illustrated. Describes use of escalators in subways, department stores, theatres and industrial buildings. Also included elevators and dock elevators.

Richards-Wilcox Mfg. Co., Aurora, Ill.

Elevators. Booklet. 8½ x 11 in. 24 pp. Illustrated. Describes complete line of "Ideal" elevator-door hardware and checking devices, also automatic safety devices.

Sedgwick Machine Works, 151 West 15th Street, New York.

Catalog and descriptive pamphlets. 4¼ x 8¼ in. 70 pp. Illustrated. Descriptive pamphlets on hand power freight elevators, sidewalk elevators, automobile elevators, etc.

FENCES

The Stewart Iron Works Company, Cincinnati, Ohio.

Book of Designs "B." 9 x 12 in. 80 pp. Illustrated. Book of designs illustrated from photographs of ornamental iron fence and entrance gates erected by us. Valuable to architects.

FIRE DOORS—See Doors, Windows and Trim, Metal

FIREPLACE EQUIPMENT

Covert Co., H. W., 137 E. 46th Street, New York, N. Y.

Hints on Fireplace Construction. Catalog. 5⅝ x 8½ in. 11 pp. Illustrated. Diagrams of construction and installation of Covert "Improved" and "Old Style" Dampers and Smoke Chambers. Also illustrations of Covert brass and wrought iron Fireplace Fittings.

FIREPROOFING—See also Construction, Fireproof

The General Fireproofing Company, Youngstown, Ohio.

Fireprofing Handbook. 64 pp. 8½ x 11 in. Illustrated. Gives methods of construction, specifications, data on Herringbone metal lath, steel tile, Trussit solid partitions, steel lumber, self-centering formless concrete construction.

FLOOR HARDENERS

General Chemical Company, 40 Rector Street, New York City.

Hard-n-tyte Engineering Service. Booklet. 16 pp. 7½ x 10½ in. Describes Hard-n-tyte and its uses in connection with surface treatments of concrete with illustrations of specific applications.

The Hard-n-tyte Specification Folder. 2 pp. 7½ x 10½ in. Gives exact specifications for concrete floor finish.

Sample Bond. 9 x 14½ in. Duplicate of Five Year Guaranty Bond furnished on floors treated with Hard-n-tyte.

FLOOR HARDENERS (CHEMICAL)

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York.

Lapidolith, the liquid chemical hardener. Complete sets of specifications for every building type in which concrete floors are used, with descriptions and results of tests.

FLOORING

Armstrong Cork & Insulation Co., 132 24th Street, Pittsburgh, Pa.

Linotile Floors. Catalog. 6 x 9 in. 40 pp. Color Plates. Describes Linotile, a composition of ground cork, wood flour, linseed oil and various gums and pigments in tile form.

Armstrong's Cork Tile. Revised Edition. Booklet. 24 pp. 5 x 7 in. Illustrated in color. Contains complete specifications.

Armstrong Cork Co., (Linoleum Dept), Lancaster, Pa.

Armstrong's Linoleum Floors. Catalog. 8½ x 11 in. 54 pp. Color plates. A technical treatise on linoleum, including table of gauges and weights and specifications for installing linoleum floors.

Decorative Floors. Booklet. 11¼ x 15 in. 16 pp. Color plates.

Armstrong's Linoleum Pattern Book, 1923. Catalog. 3½ x 6 in. 168 pp. Color Plates. Reproductions in color of all patterns of linoleum and cork carpet in the Armstrong line.

Quality Sample Book. Three books. 3½ x 5¾ in. Showing all gauges and thicknesses in the Armstrong line of linoleum and cork carpets.

Detailed Directions for Laying and Caring for Linoleum. Handbook 5 x 7 in. 48 pp. Instructions for linoleum layers and others interested in learning most satisfactory methods of laying and taking care of linoleum.

Business Floors. Booklet. 6 x 9 in. 48 pp. Illustrated in color. Explains use of linoleum for offices, stores, etc., with reproductions in color of suitable patterns, also specifications and instructions for laying.

Bonded Floors Company, Inc., New York, N. Y.

Gold-Seal Treadlite Tile. Booklet. 7⅞ x 10¾ in. 32 pp. Illustrated. An illustrated booklet showing Treadlite Tile installations and containing general information, specifications, etc., with reproductions of the product in color.

Gold-Seal Rubber Tile Folder. Folder 7⅛ x 10¾ in. 8 pp. Illustrated. A folder describing the usages and composition of Rubber Tile. Profusely illustrated with pictures of installations and reproductions of the product in color.

Carter Bloxonend Flooring Co., Long Bldg., Kansas City, Mo.

Bloxonend Flooring. Booklet. 3¼ x 6¼ in. 20 pp. Illustrated. Describes uses and adaptability of Bloxonend Flooring to concrete, wood or steel construction, and advantages over loose wood blocks.

Specification Sheet. 4 pp. 8½ x 11 in. Illustrated. Standard Specifications in convenient form for Architects and Engineers.

Lateral Nailing Specification. Folder. 8½ x 3¾ in. 4 pp. Illustrated. Shows how this methad of nailing eliminates embedded sleepers, wood sub-floor or nailing strips.

What's in a Name? Folder. 8½ x 11 in. Illustrated. Enumerates advantages of a heavy service flooring that lays smooth and stays smooth.

The Marbleloid Co., 461 Eighth Ave., New York, N. Y.

The Universal Flooring for Modern Buildings. Booklet. 6¾ x 9¾ in. 32 pp. Illustrated. Describes uses and contains specifications for Marbleloid flooring, base, wainscoting, etc.

Marbleloid Flooring for Hospitals. Bulletin. 8½ x 11 in. 4 pp. Illustrated. Describes the especial features of this composition floor for hospital buildings.

Marbleloid Specifications. Booklet. 8½ x 11 in. 4 pp. Illustrated.

Marbleloid Flooring for Schools. Bulletin. 8½ x 11 in. 4 pp. Illustrated. Describes special features of the composition floor for school buildings.

Muller Co., Franklyn, R., Waukegan, Ill.

Asbestone Composition Flooring. Circulars, 8½ x 11 in. Descriptions and Specifications.

The Nairn Linoleum Company, 179 Belgrove Drive, Kearny, N. J.

Linoleum Booklet. 5½ x 8½ in. 68 pp. Illustrated in color. Reproductions in color of Inlaid, Printed, Plain and Battleship Linoleum; also Cork Carpets and Felt Base Floor Coverings.

Stedman Products Company, South Braintree, Mass.

Six-page folder. 8½ x 10½ in. Illustrated in colors, giving complete description of Stedman Naturized Flooring, Tiles, Wainscoting, Sanitary Bases, Stair Treads, etc. Technical data, recommendations, and special flooring service.

FURNACES—See Heating Equipment

FURNITURE

Allen, Louis L., 521 Madison Ave., New York, N. Y.

Booklet. 5 x 7½ in. Illustrated. Issued twice a year, listing many antique pieces of furniture, old oak and pine paneling and garden figures: fountains, bird baths, sundials, etc.

American Seating Co., 14 E. Jackson Blvd., Chicago, Ill.

Ars Ecclesiastica Booklet. 8½ x 11 in. 48 pp. Illustrations of church fitments in carved wood.

Theatre Chairs. Booklet. 6 x 9 in. 48 pp. Illustrations of theatre chairs.

Hampton Shops, 18 East 50th St., New York, N. Y.

Glimpses from Hampton Exhibits. Brochure. 16 pp. 5 x 7½ in. Illustrated. Shows examples of Hampton work and gives one an idea of their resources. Of interest to the client as well as to the architect.

Kensington Mfg. Company, 14 East 32nd St., New York, N. Y.

Photographs and full description of hand-made furniture in all the period styles furnished promptly in response to a specific inquiry.

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In Canada: ANACONDA AMERICAN BRASS LIMITED, NEW TORONTO, ONTARIO

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 70*

GLASS CONSTRUCTION

Mississippi Wire Glass, 220 Fifth Avenue, New York.
Mississippi Wire Glass. Catalog. 3⅞ x 8½ in. 32 pp. Illustrated. Covers the complete line.

Plate Glass Mfrs. of America. First National Bank Bldg., Pittsburg, Pa.
Plate Glass. Booklet. 5¾ x 9¼ in. 12 pp. Describes manufacture and use of plate glass, with sizes.

GRANITE—See Stone, Building

HARDWARE

The American Pulley Company, 4200 Wissahickon Ave., Philadelphia, Pa.
Sash Pulleys of Pressed Metal. Booklet. 7½ x 5½ in. 44 pp. Illustrated. Contains description of pressed metal sash pulley, with complete dimensions and style numbers for finishes and trade name.

Cutler Mail Chute Company, Rochester, N. Y.
Cutler Mail Chute Model F. Booklet. 4x 9¼ in. 8 pp. Illustrated.

McCabe Hanger Manufacturing Company, 425 West 25th St., New York, N. Y.
Elevator Door Hangers. Booklet. 6 x 9 in. 8 pp. Illustrated. Descriptive booklet showing different types of elevator door hangers. Full size details sent upon request.
Special Folding and Accordion Door Hangers. Booklet. 6 x 9 in. 8 pp. Illustrated. Booklet with complete description of various types of folding and accordion door hangers. Full size details upon request.

McKinney Mfg. Co., Pittsburgh, Pa.
McKinney Complete Garage Hardware Sets. Catalog. 6¾ x 10 in. 20 pp. Illustrated. Describes full line of complete garage hardware sets for all kinds of entrances, with views of typical entrances and sketches.
McKinney Hinges and Butts. General Catalog. 6¾ x 10 in. Illustrates and describes complete line of McKinney wrought builders' hardware products, including hinges, butts, door hangers and track, latches, garage hardware and specialties.

Richard-Wilcox Mfg. Co., Aurora, Ill.
Distinctive Garage Door Hardware. Booklet. 8½ x 11 inches. 65 pp. Illustrated. Complete information accompanied by data and illustrations on different kinds of garage door hardware.

Sargent & Co., New Haven, Conn. Book of Designs.
Booklet 76 pp. 6½ x 5 inches, illustrated. Illustrates and describes details of door hardware, locks, escutcheons, roses, etc.
Details to Which Standard Hardware Can Be Applied. Booklet 6 pp. 9 x 12 inches, illustrated. Treats with diagrams, portions of doors and windows to which hardware can be applied.

Vonnegut Hardware Co., Indianapolis, Ind.
Von Duprin Self-Releasing Fire Exit Devices. Catalog. 12F. 8 x 11 in. 41 pp. Illustrated.
"Saving Lives." Booklet. 3¼ x 6 in. 16 pp. Illustrated. A brief outline why Self-Releasing Fire Exit Devices should be used.

HEATING EQUIPMENT

American District Steam Company, North Tonawanda, N. Y.
Adsco Heating. Bulletin No. 158. 6¼ x 9¼in. 16 pp. Illustrated. Describes Adsco System of Atmospheric Steam Heating, its principle and operation.
Catalog No. 21-AF. 6 x 9 in. 200 pp. Illustrated. Lists and describes the full line of equipment and devices manufactured for use on underground and interior steam mains, expansion joints, steam meters, condensation meters, traps, flange fittings, angle fittings, manhole curbs, alignment guides, etc.

Clarage Fan Company, Kalamazoo, Mich.
Catalog No. 52. 8½ x 11 in. 84 pp. Illustrated. Describes Clarage Kalamazoo Multiblade Fans and Heaters for use in schools, churches, hospitals and industrial plants. Engineering data, capacity tables and dimensions included.

James B. Clow & Sons, 534 S. Franklin Street, Chicago, Ill.
Gasteam. Catalog. 6 x 9 in. 16 pp. Illustrated. New radiator using gas for fuel.

Excelso Specialty Works, 119 Clinton St., Buffalo, N. Y.
Excelso Water Heater. Booklet. 12 pp. 3 x 6 in. Illustrated. Describing the new Excelso method of generating domestic hot water in connection with heating boilers. (Firepot Coil eliminated.)

The Fulton Company, Knoxville, Tenn.
Sylphon Temperature Regulators. Bulletin T-103. 8½ x 11 in. 16 pp. Complete data on Sylphon temperature regulators for air and liquids. Catalog 100, complete line Sylphon Heating Specialties.
Damper Regulators, Air and Vent Valves. Catalog No. 100. 3¾ x 6¼ in. Sylphon Damper Regulators for steam, hot water and vapor systems. Sylphon Air and Vent Valves.

Illinois Engineering Co., Racine Ave. at 21st St., Chicago, Ill.
Vapor Heat Bulletin 21. 8½ x 11 in. 32 pp. Illustrated. Contains new and original data on Vapor Heating. Rules for computing radiation, pipe sizes, radiator tappings. Steam table showing temperature of steam and vapor at various pressures, also description of Illinois Vapor Specialties.

Johnson Service Company, 149 Michigan St., Milwaukee, Wis.
Regulation of Temperature and Humidity. Booklet. 11¼ x 8½ in. 64 pp. Illustrated. Describes Johnson system of pneumatic, automatic regulation of temperature and humidity, and illustrates thermostats, valves, air compressors, dampers, and other parts.
Johnson Electric Thermostats, Valves and Controllers. Booklet. 6⅛ x 3½ in. 24 pp. Illustrated. Excellent plates showing electric thermostats and controllers.

Kelsey Heating Company, James St., Syracuse, N. Y.
Booklet No. 5. 4 x 9 in. 32 pp. Illustrated. A dealers' booklet showing the Kelsey Warm Air Generator Method of warming and distributing air. Gives dimensions, heating capacities, weights, kind of coal recommended, and shows the mechanical and gravity system of heating homes, churches and schools.
Monroe Pipeless Booklet, 4½ x 8 in. 20 pp. Illustrated.
Monroe Tubular Heater. Booklet. 4½ x 8 in. 20 pp. Illustrated. General Booklet giving capacities, dimensions, weights, etc.
Syracuse Pipeless Booklet. 4½ x 8 in. 12 pp. Illustrated. General Booklet giving sizes and capacities.

HEATING EQUIPMENT—Continued

Kewanee Boiler Co., Kewanee, Ill.
Kewanee on the Job. Catalog. 8½ x 11 in. 80 pp. Illustrated. Showing installations of Kewanee boilers, water heaters, radiators, etc.
Catalog No. 73. 6 x 9 in. 35 pp. Illustrated. Describes Kewanee steel power boilers with complete specifications.

Minneapolis Heating Regulator Company, Minneapolis, Minn.
The Heart of the Heating Plant. Catalog. 6 x 9 in. 20 pp. Illustrated. Describing the Minneapolis Heat Regulator, its construction, application and operation for the automatic control of temperature where coal, gas, fuel oil or street steam is used.

Page Boiler Company, The Wm. H., 141 West 36th Street, New York, N. Y.
Page Boilers. **"The Distinguished Service Line."** Catalog. 4½ x 7½ in. 120 pp. Illustrated. Descriptions with specifications of the "Volunteer" Round and "Monarch" Square Sectional Steam and Hot Water Boilers—the "Monarch" Up-Draft Smokeless and Down-Draft Smokeless Boilers—Push Nipple and Header Types—with method for apportioning size of boiler and radiation, and other valuable heating data.
"Volunteer" Round Boilers. Folder, 6¼ x 9½ in. Illustrated. Ratings and dimensions, and assemblage of the various series.
"Monarch" (Regular) Square Sectional Boilers. Push Nipples and Header Types. Folder. 8 x 11 in. Illustrated. Description, ratings and Header Types. Folder. 8 x 11 in. Illustrated. Description, ratings and dimension.
"Monarch" Up-Draft Smokeless and Down-Draft Smokeless Boilers. Push Nipple and Header Types. Folders. 8 x 11 in. Illustrated. Description of the features which adapt the "Monarch" Up-Draft Smokeless for the use of any available fuel, a vital factor in these times of shortage and substitution. Ratings and dimensions.

Utica Heater Company, Utica, N. Y.
Imperial Round and Square Boilers and Supplies. Catalog. 3½ x 6½ in. Gives complete data on small heaters.
Special Folders. 8½ x 11 in. "Warmth and Comfort," describing the scientifically correct NEW IDEA pipeless furnaces. "SUPERIOR Warm Air Pipe Furnaces," a standard line of heating equipment for over forty years. "SUPER-SMOKELESS Pipe and Pipeless Furnaces," a new and remarkably efficient warm air heater, burning cheap soft coal without smoke—utilizing the principle of the Bunsen Burner.
"Imperial Sectional Square Boilers," for hard coal heating of all types of buildings.
Utica Imperial SUPER-SMOKELESS Boiler. Catalog. 8½ x 11 in. Consists of the following seven bulletins, either loose or bound together: (1) School Heating Bulletin. (2) Public Building Bulletin. (3) Theatre Heating Bulletin. (4) Churches and Religious Institutions. (5) Residences, Apartments and Hotels. (6) Offices, Industrial Buildings and Garages. (7) Technical Bulletin describing patented Bunsen Burner design and construction of the SUPER-SMOKELESS BOILER, which burns the cheapest grades of soft coal smokelessly and operates equally well with hard coal, coke or fuel oil.

HEAT REGULATORS—See Heating Equipment

HOISTS—See Ash Hoists

HOLLOW TILE—See Tile, Hollow

HOSPITAL EQUIPMENT

The International Nickel Company, 67 Wall St., New York, N. Y.
Hospital Applications of Monel Metal. Booklet. 8½ x 11½ in. 16 pp. Illustrated. Gives types of equipment in which Monel Metal is used, reasons for its adoption, with sources of such equipment.

The Kny-Scheerer Corporation of America, 119 Seventh Ave., New York.
Hospital Equipment, 16th Edition. 7¼ x 10½ in. 232 pp. Illustrated. Complete description of Hospital and Surgical Furniture, Hospital Appliances including Operating Tables, Cabinets, Sterilizers for Water, Dressing and Instruments, also Hydrotherapeutic Apparatus.
Surgical Sundries. P/2 Edition. Booklet. 7⅜ x 10½ in. 48 pp. Illustrated. A complete line of glassware, enamelware, rubber goods, restraint apparatus, instrument sterilizers, sputum cups, wheel chairs and sick room comforts.
Electro-Medical. 25th Edition. Booklet. 7¼ x 10½ in. 160 pp. Illustrated. A complete line of Albee Bone Sets, Apparatus for AC and DC, Cystocopes, Heat Magnets, Vibrators, Compressors, Electric Light Baths, High Frequency Apparatus and X-Ray Apparatus and Accessories.

INCINERATORS

The Kerner Incinerator Company, 1029 Chestnut St., Milwaukee, Wis.
The Kernerator. Booklet. 5½ x 9¼ in. 40 pp. Illustrated. Describes principle and design of the Kernerator, guarantee and service, also gives illustrations of buildings where it has been installed and testimonials.
Sanitary Elimination of Household Waste. Booklet. 4 x 9 in. 16 pp. Illustrated. Shows process, installations and advantages of the Kernerator.
Sanitary Disposal of Waste in Hospitals. Booklet. 4 x 9 in. 12 pp. Illustrated. Shows how this necessary part of hospital service can be taken care of by the Kernerator.

INSULATION

Bishopric Manufacturing Co., 103 Este Ave., Cincinnati, Ohio.
Specifications and Working Details. Booklet. 7¾ x 10½ in. Illustrated. Contains plainly written instructions for the use of stucco, stucco base, plaster base and insulation base.

Philip Carey Co., The, Cincinnati, Ohio.
Carey Asbestos and Magnesia Products. Catalog. 6 x 9 in. 72 pp. Illustrated.

Johns-Manville, Inc., Madison Ave., and 41st St., New York, N. Y.
Johns-Manville Service to Power Users. Catalog. 8½ x 11 in. 150 pp. Illustrated. Contains valuable data on all forms of insulations, packings, steam traps, high temperature cements, brake locks and linings, also general technical data.

PAGE BOILERS

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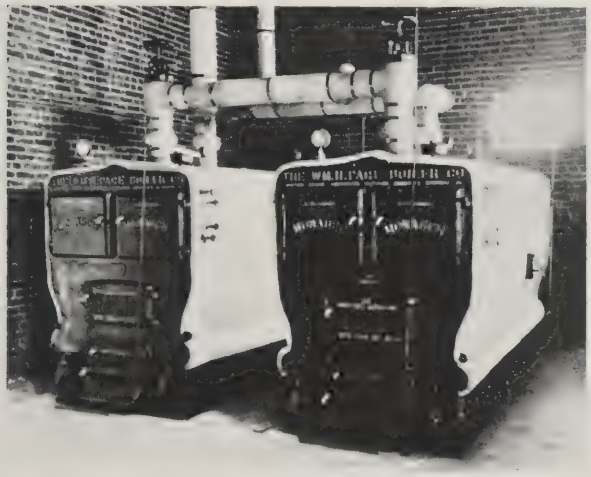

Showing the installation of two S-40-14 "Monarch" Smokeless Boilers in the above plant.

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Since electricity is universally supplanting steam for power purposes, the use of the steel high pressure boiler is dispensed with. Cast Iron Low Pressure Boilers are now being generally installed for heating, with a saving of 25% to 50% in fuel.

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Factory: MEADVILLE, PA.

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 72*

INSULATION—Continued

United States Mineral Wool Co., 280 Madison Ave., New York.
The Uses of Mineral Wool in Architecture. Booklet. 5¼ x 6⅝ in. 24 pp. Illustrated. Describes properties of mineral wool as insulation against heat, frost, sound. Specifications and section drawing for use as a fireproofing. Rule for estimate and cost.

KITCHEN EQUIPMENT

Colt's Patent Fire Arms Mfg. Company, Hartford, Conn.
AUTOSAN Dish and Silver Cleaning Machines. Booklets. 6 x 9 in. Describing rotary table type and conveyor type machines.

Wm. M. Crane Company, 16-20 West 32nd St., New York, N. Y.
VULCAN Gas Ranges and Appliances. Booklet. 5 x 8 in. 50 pp. Illustrated. Describes complete line, including VULCAN SMOOTH TOP Compact Cabinet Gas Ranges for kitchens in the home.
VULCAN Gas Equipment for Hotels, Hospitals, Restaurants, etc. Booklet. 5 x 8 in. 45 pp. Illustrated. Equipment for heavy-duty cooking requirements, with information of value to architects in planning kitchens.

The International Nickel Company, 67 Wall St., New York, N. Y.
Hotels, Restaurants and Cafeteria Applications of Monel Metal. Booklet. 8½ x 11 in. 32 pp. Illustrated. Gives types of equipment in which Monel Metal is used, with service data and sources of equipment.

Pick & Company, Albert, 208 W. Randolph St., Chicago, Ill.
School Cafeterias. Portfolio. 17 x 11 in. 44 pp. Illustrated. An exhaustive study of the problems of school feeding, with copious illustrations and blue prints. Very valuable to the architect.
Hotel, Apartment Building, Club and Institution Installations. Portfolio. 17 x 11 in. 100 pp. Shows, mostly by plates, how the Albert Pick Company equips hotels completely from top to bottom.
Equipment for Cafeterias, Lunch Rooms, Restaurants, and Dining Rooms Portfolio. 17 x 11 in. 86 pp. Illustrated. The last word in Cafeteria equipment to meet all requirements.

LATH, METAL AND REINFORCING

The General Fireproofing Company, Youngstown, Ohio.
Herringbone Metal Lath Handbook. 8½ x 11 in. 32 pp. Illustrated. Standard specifications for Cement Stucco on Herringbone Rigid Metal Lath and interior plastering.

National Steel Fabric Company, Pittsburgh, Pa.
Folder. 8½ x 11 in. 6 pp. Illustrated. Describes National Stucco-Plaster Reinforcement, a base for exterior stucco and interior plastering, composition flooring, etc., with photographs and drawings.

North Western Expanded Metal Co., 934 Old Colony Building, Chicago, Ill.
Designing Data. Catalog. 6 x 9 in. 94 pp. Illustrated. Describes most efficient use of Econo Expanded Metal Reinforcing. Formless Concrete Construction. Catalog. 6 x 9 in. 80 pp. Illustrated. Describes use of T-Rib Chanelath, a form and reinforcing for concrete.

LAUNDRY CHUTES

The Pfaudler Company, 217 Cutler Building, Rochester, N. Y.
Pfaudler Glass-Lined Steel Laundry Chutes. Booklet. 5⅛ x 7⅜ in. 16 pp. Illustrated. A beautifully printed brochure describing in detail with architects' specifications THE PFAUDLER GLASS LINED STEEL LAUNDRY CHUTES. Contains views of installations and list of representative ones.

LEADERS AND GUTTERS

Copper & Brass Research Assn., 25 Broadway, New York, N. Y.
Copper Roofing. Booklet. 8½ x 11 in. 32 pp. Illustrated. Gives information regarding weights of various roofing materials. Describes up-to-date practice and methods of laying copper roofs; decorative effects and how to obtain them. Gives specifications and details. Flashings, reglets, gutters and leaders, cornices and copper-covered walls.

United Alloy Steel Corporation, Canton, Ohio.
Better Sheet Metal, 8½ x 11 in. 128 pages and cover. Illustrated. Shows the many uses of Toncan Metal with many pictures of buildings, names of architects, etc., also tables of weights and other useful specification data.

MAIL CHUTES

Cutler Mail Chute Company, Rochester, N. Y.
Cutler Mail Chute Model F. Booklet. 4 x 9¼ in. 8 pp. Illustrated.

MANTELS

Arthur Todhunter, 414 Madison Ave., New York, N. Y.
Mantels and Fireplace Equipment. Booklet. 8½ x 11 in. Illustrated. Separate sheet plates showing mantels installed and furnished, also andirons and grates grouped with suitable pieces, also lanterns, weather-vanes and hand-wrought hardware. All sizes and descriptions given on each plate.

MARBLE

The Georgia Marble Company, Tate, Ga. New York Office, 1328 Broadway.
Why Georgia Marble is Better. Booklet. 3⅜ x 6 in. Gives analysis, physical qualities, comparison of absorption with granites, opinions of authorities, etc.
Convincing Proof. Booklet. 3⅜ x 6 in. 8 pp. Classified list of buildings and memorials in which Georgia Marble has been used, with names of Architects and Sculptors.

Tompkins-Kiel Marble Company, 505 Fifth Ave., New York, N. Y.
Reproductions in natural colors of imported and domestic marbles and stone for interior and exterior uses.
Bulletins. 9¾ x 12¾ in. illustrating buildings of various types in which Tompkins-Kiel Marble Company's imported and domestic marbles and stone have been used.

METAL LATH—See Lath, Metal and Reinforcing

METALS

American Sheet & Tin Plate Co., Frick Building, Pittsburgh, Pa.
Reference Book. Pocket Ed. 2½ x 4½ in. 168 pp. Illustrated. Covers the complete line of Sheet and Tin Mill Products.
Apollo and Apollo-Keystone Galvanized Sheets. Catalog. 8½ x 11 in. 20 pp. Illustrated.

METALS—Continued

Research on the Corrosion Resistance of Copper Steel. Booklet. 8½ x 11 in. 24 pp. Illustrated. Technical information on results of atmospheric corrosion tests of various sheets under actual weather conditions.
Facts Simply and Briefly Told. Booklet. 8½ x 11 in. 16 pp. Illustrated. Non-technical statements relating to Keystone Copper Steel.
Black Sheets and Special Sheets. Catalog. 8½ x 11 in. 28 pp. Illustrated. Describes standard grades of Black and Uncoated Sheets, together with weights, bundling tables, etc.
Bright Tin Plates. Catalog. 8½ x 11 in. 16 pp.

Bridgeport Brass Company, Bridgeport, Conn.
Seven Centuries of Brass Making. Booklet. 10½ x 8 in. 78 pp. Illustrated in color. A brief history of the ancient art of Brass Making and its early (and even recent) method of production—contrasted with that of the Electric Furnace Process—a twentieth century achievement of the Bridgeport Brass Company.
Tested High-Speed Brass Rod. Booklet 10½ x 8 in. 16 pp. Illustrated. Short treatise on the manufacture of Brass Rod for use in Screw Machines, with particular reference to improvements originated by the Bridgeport Brass Company.

Copper & Brass Research Assn., 25 Broadway, New York, N. Y.
Copper Roofing. Booklet. 8½ x 11 in. 32 pp. Illustrated. Gives information regarding weights of various roofing materials. Describes up-to-date practice and methods of laying copper roofs; decorative effects and how to obtain them. Gives specifications and details. Flashings, reglets, gutters and leaders; cornices and copper-covered walls.

The International Nickel Company, 67 Wall St., New York, N. Y.
The Choice of a Metal. Booklet. 6¼ x 3¼ in. 16 pp. Illustrated. Monel Metal—its qualities, use and commercial forms, briefly described.

United Alloy Steel Corporation, Canton, Ohio.
Sheet Metal Primer. 5¼ x 7¾ in. 32 pages and cover. Illustrated. A non-technical description of the making of iron and steel from ore to sheet metal and a brief discussion of modern developments in this field.
Metallurgy of Modern Commercial Iron Sheets. Booklet. 3⅜ x 6¼ in. 16 pages. An interesting discussion of the methods used in producing metal sheets.

METAL TRIM—See Doors and Trim, Metal

MILLWORK—See also Wood

Curtis Companies Service Bureau, Clinton, Iowa.
Architectural Interior and Exterior Woodwork, Standardized. Book. 9 x 11½ in. 240 pp. Illustrated. This is an Architects' Edition of the complete catalog of Curtis Woodwork, as designed by Trowbridge & Ackerman. Contains many color plates.
Better Built Homes, Vols. XV-XVIII incl. Booklet. 9 x 12 in. 40 pp. Illustrated. Designs for houses of five to eight rooms, respectively, in several authentic types, by Trowbridge & Ackerman, architects for the Curtis Companies.
Curtis Details. Booklet. 19½ x 23½ in. 20 pp. Illustrated. Complete details of all items of Curtis woodwork, for the use of architects.

MORTAR COLORS

Clinton Metallic Paint Co., Clinton, N. Y.
Color Harmony in Brick Work. Folder. 6⅜ x 3¾ in. Illustrated. Describes use of Clinton Mortar Colors, with illustrations in colors.

ORGANS

Estey Organ Company, Brattleboro, Vt.
Pipe Organs. Complete specifications and full information furnished to the architect for pipe organ to be installed in any given residence upon receipt of plans and other particulars.

PAINTS, STAINS, VARNISHES AND WOOD FINISHES

Acme White Lead & Color Works, Detroit, Mich.
Booklet. 9 x 12 inches, 44 pp. Specifications for paint, enamel, varnish and dampproofing material.

Boston Varnish Co., Everett Station, Boston 49, Mass.
The Inviting Home. Booklet. 5½ x 8 in. 16 pp. Illustrations in colors of attractive interiors.
Set of Twelve Measured Drawings. 8½ x 11 in.
Kyanize—Its Important Place in Recent Eastern Architecture. Booklet. 6 x 9 in. 16 pp. Varnish and Enamel Specifications.

Cabot, Inc., Samuel, Boston, Mass.
Cabot's Creosote Stains, Booklet. 4 x 8½ in. 16 pp. Illustrated.

The Glidden Company, Cleveland, Ohio.
"More Daylight." 8 x 10½ in. 20 pp. Portraying by illustrations and text the need and methods of modern mill painting.

The Hockaday Company, 1823 Carroll Ave., Chicago, Ill.
Paint Mileage. Book. 8 x 10½ in. 56 pp. Illustrated. A reference book on interior painting. Describes use of paint over all sorts of surfaces, with illustrations of buildings where Hockaday has been specified. Hockaday service explained.
Solving Your Paint Problems. Booklet. 8½ x 11 in. 44 pp. Illustrated. Describes use of Hockaday Paint in Industrial Buildings, particularly in textile mills. Details of Hockaday service and specifications.

Martin Varnish Co., 2500 Quarry St., Chicago, Ill.
Architectural Specifications. Booklet. 8½ x 11 in. 20 pp. Illustrated. Complete guide for Architects in specifying Martin Varnish Products.
Your Floors. Booklet. 5 x 7 in. 20 pp. Illustrated. Explains fully how to finish all kinds of floors and woodwork with Martin's Pure Varnish.

Murphy Varnish Company, 234 McWhorter St., Newark, N. J.
The Book of Decoration. Booklet. 46 pp. 8½ x 11 in. Illustrated. Written and illustrated by masters of the art. Old and modern interiors by famous Architects. Characteristic paneling, ceilings, floors, hangings and furnishings of each period are illustrated and charted. Price 50 cents.
Eight Periods and Their Modern Adaptation. Furnished to Architects and Builders. In this volume the historic architectural periods are illustrated with authentic photographs of famous

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 74*

PAINTS, STAINS, VARNISHES AND WOOD FINISHES—Con'd

interiors. Each period is charted to show correct treatment for different rooms. Complete architectural specifications included.

Univernish, the Universal Varnish. Booklet. 3¼ x 6 in. 8 pp. Describes the uses, working and economy of Univernish.

Muronic Enamel. Descriptive leaflet and price-list. 4 pp. 4 x 6 in.

National Lead Company, 111 Broadway, New York, N. Y.

Handy Book on Painting. Book. 5½ x 3¼ in. 100 pp. Gives directions and formulas for painting various surfaces of wood, plaster, metal, etc., both interior and exterior.

Red Lead in Paste Form. Booklet. 6¼ x 3½ in. 16 pp. Illustrated. Directions and formulas for painting metals.

Came Lead. Booklet. 8¾ x 6 in. 12 pp. Illustrated. Describes various styles of lead cames.

Cinch Anchoring Specialties. Booklet. 6 x 3½ in. 20 pp. Illustrated. Describes complete line of expansion bolts.

The Ripolin Company, Cleveland, Ohio.

Ripolin Specifications. Book. 8 x 10¼ in. 12 pp. Complete specifications and general instructions for the application of Ripolin, the original Holland enamel paint. Also directions for proper finishing of wood, metal, plaster, concrete, brick and other surfaces.

"Why Ripolin Has an International Reputation." 8 x 10¾ in. 24 pp. Designed for the architect's files to illustrate the many varied uses of Ripolin Enamel Paint in all parts of the world. Profusely illustrated.

Ruberoid Co., The (formerly the Standard Paint Co.), 95 Madison Avenue, New York, N. Y.

Preservative Coatings. Booklet. 6 x 9 in. 15 pp. Illustrated. Presents in a concise manner the properties and uses of the Ruberoid Company's various paint preparations.

Sherwin-Williams Company, 601 Canal Rd., Cleveland, Ohio.

Painting Concrete and Stucco Surfaces. Bulletin No. 1. 8½ x 11 in. 8 pp. Illustrated. A complete treatise with complete specifications on the subject of Painting of Concrete and Stucco Surfaces. Color chips of paint shown in bulletin.

Enamel Finish for Interior and Exterior Surfaces. Bulletin No. 2. 8½ x 11 in. 12 pp. Illustrated. Thorough discussion including complete specifications tor securing the most satisfactory enamel finish on interior and exterior walls and trim.

Painting and Decorating of Interior Walls. Bulletin No. 3. 8½ x 11 in. 20 pp. Illustrated. A wonderful reference book on Flat Wall Finish including texture effects which are taking the country by storm. Every architect should have one on file.

Protective Paints for Metal Surfaces. Bulletin No. 4. 8½ x 11 in. 12 pp. Illustrated. A highly technical subject treated in a simple, understandable manner.

Smith & Co., Edward, P. O. Box 76, City Hall Station, New York, N. Y.

Architect's Handoook. 3¾ x 7½ in. 24 pp. Specifications and suggestions for painting, varnishing, enameling, etc.

Sonneborn Sons, Inc., L., Dept. 4, 116 Fifth Avenue, New York.

Paint Specifications. Booklet. 8½ x 10¾ in. 4 pp.

PANELING—See Millwork

PARTITIONS

Improved Office Partition Company, 25 Grand St., Elmhurst, L. I.

Telesco Partition, Catalog. 8¼ x 11 in. 14 pp. Illustrated. Shows typical offices laid out with Telesco partitions, cuts of finished partition units in various woods. Gives specifications and cuts of buildings using Telesco.

Detailed Instructions for erecting Telesco Partitions. Booklet. 24 pp. 8½ x 11 in. Illustrated. Complete instructions, with cuts and drawings, showing how easily Telesco Partition can be erected.

Richards-Wilcox Mfg. Co., Aurora, Ill.

Partitions. Booklet. 7 x 10 in. 32 pp. Illustrated. Describes complete line of track and hangers for all styles of sliding, parallel, accordion and flush door partitions.

The J. G. Wilson Corporation, 11 East 36th St., New York, N. Y.

Rolling Partitions, Hygienic and Disappearing Door Wardrobes. Booklet. 6 x 9 in. 32 pp. Illustrated. Describes rolling partitions, particularly in churches and schools, and wardrobes as installed in schools and public institutions.

PIPE

American Brass Company, Waterbury, Conn.

Bulletin B-1, "Brass Pipe for Water Service." 8½ x 11 in. 28 pp. Illustrated. Gives schedule of weights and sizes (I.P.S.) of seamless brass and copper pipe, shows typical installations of brass pipe, and gives general discussion of the corrosive effect of water on iron, steel and brass pipe.

Bridgeport Brass Company, Bridgeport, Conn.

Bulletin No. 15. Brass Pipe and Piping. Booklet. 8 x 10½ in. 48 pp. Illustrated. When and how to use Brass Pipe. Brass pipe compared with iron and steel pipe for hot water service. Corrosion. Description of manufacture of Bridgeport Plumrite Brass Pipe.

A. M. Byers Company, 235 Water St., Pittsburgh, Pa.

Bulletin 26-A. "What is Wrought Iron?" 8 x 10¾ in. 40 pp. Illustrated. Descriptions of materials and processes employed in manufacturing Byers genuine wrought iron pipe. Factors influencing corrosion. Gives table of pipe sizes, weights, dimensions, tests, etc., and tabulated records of the life of iron and steel pipe in various kinds of service.

Bulletin 30. An Investigation of Pipe Corrosion in Hot Water Service. 8 x 10¾ in. 20 pp. Illustrated. Shows service records of iron, steel and brass pipe used for hot and cold water supply lines in 129 Pittsburgh Apartment Buildings.

Bulletin 32. Corrosion of Wright Iron, Cast Iron and Steel Pipe in House Drainage Systems. 8 x 10¾ in. 32 pp. Illustrated. Data obtained through investigations conducted in New York and Chicago by Dr. Wm. P. Gerhardt, C. E., and Thomas J. Claffy, Asst. Chief San. Inspector city of Chicago.

Bulletin 38. The installation Cost of Pipe. 32 pp. 8 x 10¾ in. Illustrated. Cost analysis of 20 different pipe installations, in power and industrial plants, office buildings, hotels, residences, etc.

Clow & Sons, James B., 534 S. Franklin Street, Chicago, Ill.

Catalog "A," 4 x 6½ in. 700 pp. Illustrated. Shows a full line of steam, gas and water works supplies.

PIPE—Continued

National Tube Co., Frick Building, Pittsburgh, Pa.

"National" Bulletin No. 2. Corrosion of Hot Water Pipe. (8½ x 11 in. 24 pp.) Illustrated. In this bulletin is summed up the most important research dealing with hot water systems. The text matter consists of seven investigations by authorities on this subject.

"National" Bulletin No. 3. The Protection of Pipe Against Internal Corrosion (8½ x 11 in. 20 pp.) Illustrated. Discusses various causes of corrosion and details are given of the deactivating and deaerating systems for eliminating or retarding corrosion in hot water supply lines.

"National" Bulletin No. 25. "National" Pipe in Large Buildings. 8½ x 11 in. 88 pp. This bulletin contains 254 illustrations of prominent buildings of all types, containing "National" Pipe and considerable engineering data of value to architects, engineers, etc.

Modern Welded Pipe. Book of 88 pages (8½ x 11 in.), profusely illustrated with halftone and line engravings of the important operations in the manufacture of pipe.

Reading Iron Company, Reading, Pa.

Reading Genuine Wrought Iron Pipe in the Making and in Service. Bulletin No. 1. 8½ x 11 in. 32 pp. Illustrated. History of the Reading Iron Company. Origin of wrought iron—description of each process of manufacture of both buttweld and lapweld pipe —Reading Pipe in various fields.

Book of Standards. Booklet. 5 x 7 in. 48 pp. Illustrated. Complete tables showing dimensions, tests and list prices on each of the 552 different kinds of Reading Tubular goods. Two simple tests for distinguishing genuine wrought iron pipe.

The Painted Molecule. Booklet. 4 x 9 in. 8 pp. Illustrated. A brief, non-technical description of the reasons for the longer life of Reading Iron Pipe, with instances of actual service.

The Ultimate Cost, Booklet. 5¼ x 7¼ in. 24 pp. Illustrated in two colors. A comparison in actual figures of the initial cost and the ultimate cost of plumbing and heating systems in several kinds of homes.

PLUMBING EQUIPMENT

American Brass Company, Waterbury, Conn.

Benedict Nickel. Illustrated pamphlet descriptive of Benedict Nickel White Metal for high-grade plumbing fixtures.

Bridgeport Brass Company, Bridgeport, Conn.

Plumbing Supplies. Booklet. 10½ x 8 in. 20 pp. Illustrated. Describes a few of the different plumbing supplies manufactured by the Bridgeport Brass Company.

Brunswick-Balke-Collender Co., 623 S. Wabash Avenue, Chicago, Ill.

Whale-bone-ite Seat. Booklet. 3½ x 6¼ in. 4 pp. Illustrated.

Whale-bone-ite Seat. Booklet. 3½ x 6¼ in. 8 pp. Illustrated.

Clow & Sons, James B., 534 S. Franklin Street, Chicago, Ill.

Catalog "M." 9¼ x 12 in. 184 pp. Illustrated. Shows complete line of plumbing fixtures for Schools, Railroads and Industrial Plants.

Crane Company, 836 S. Michigan Avenue, Chicago, Ill.

Crane Products in World Wide Use. Catalog. 5 x 9½ in. 24 pp. Illustrated.

Plumbing Suggestions for Home Builders. Catalog. 3 x 6 in. 80 pp. Illustrated.

Plumbing Suggestions for Industrial Plants. Catalog. 4 x 6½ in. 43 pp. Illustrated.

Douglas Co., The John, Cincinnati, Ohio.

Catalog "C." 10½ x 8 in. 200 pages illustrated. Illustrates and describes the Douglas complete line of China Sanitary plumbing fixture.

Booklet. "Douglas suggests for your home." 6 x 3½ in. 39 pp. Illustrated.

Eljer Company, 15 E. Van Buren St., Chicago, Ill.

The Standardized Sixteen. Booklet. 3¾ x 6¾ in. 16 pp. Illustrated. Describes fully the complete Eljer line of standardized plumbing equipment, with diagrams, weights, measurements and copious illustrations.

Standardized Sixteen. Circular. 3¾ x 6¾ in. 18 pp. Illustrated.

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Kohler Co., Kohler, Wis.

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Maddock's Sons Co., Thomas, Trenton, N. J.

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Speakman Company, Wilmington, Del.

Speakman Showers and Fixtures. Catalog. 4½ x 7½ in. 250 pp. Illustrated. Catalog of Modern Showers and Brass Plumbing Fixtures, with drawings showing layouts, measurements, etc.

Toned Up in Ten Minutes. Booklet. 7½ x 10½ in. 16 pp. Illustrated. Modern Showers and Washups for Industrial Plants, showing the sanitary method of washing in running water.

Wolff Manufacturing Company, 255 No. Hoyne Ave., Chicago, Ill.

Plumbing Suggestions. Catalog. 3¼ x 6 in. 50 pp. Illustrated. Illustrating, describing and pricing Wolff Quality Plumbing Fixtures for residential installation.

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Goulds Mfg. Co., The, Seneca Falls, N. Y.

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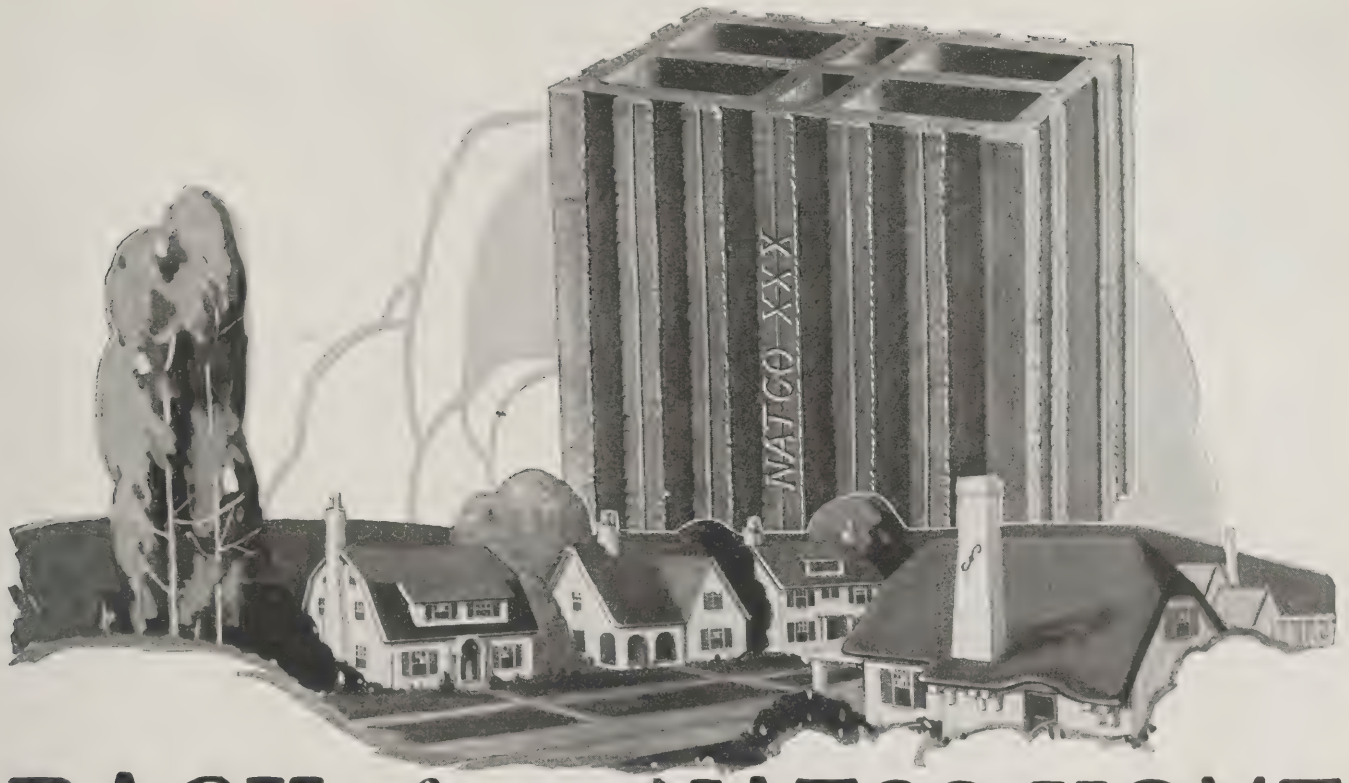

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Published Monthly by Rogers and Manson Company, 383 Madison Avenue, New York, N. Y. Yearly Subscription: U. S. A., Insular Possessions and Cuba, $6. Canada, $6.75. Foreign Countries in the Postal Union, $7.50. Single copies, 60 cents. Entered as Second Class Matter at the Post Office, New York, N. Y., under the Act of March 3, 1879.

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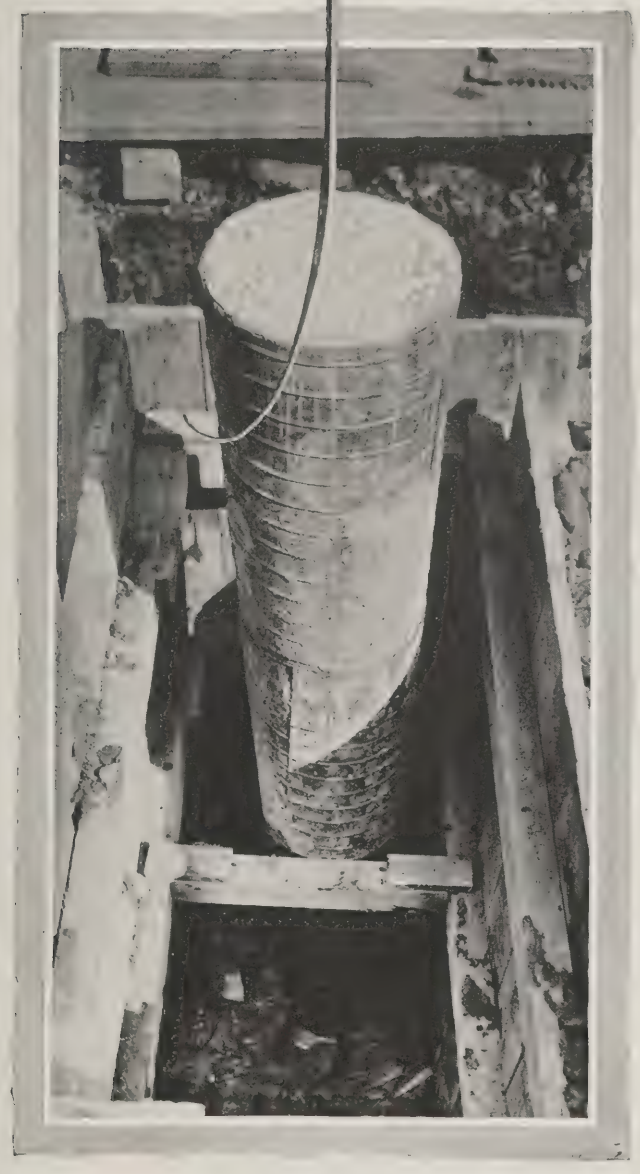

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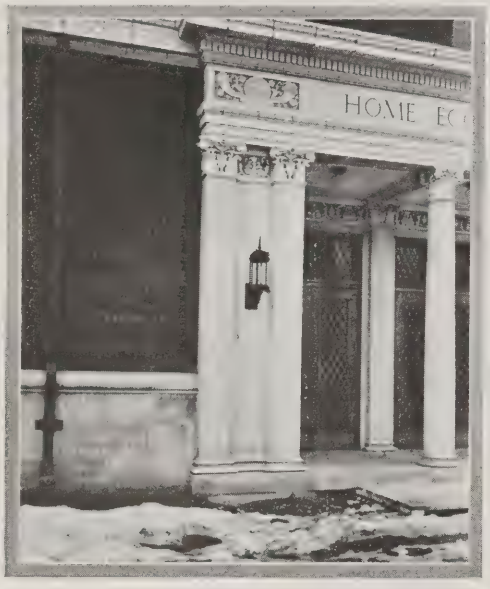

Entrance, Home Economics Building, Purdue University, LaFayette, Ind.

Robert Frost Daggett, *Architect* Indianapolis, Ind.

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BOOK DEPARTMENT

THE BOOK OF DECORATION. Price 50 cents. EIGHT PERIODS AND THEIR MODERN ADAPTATION. Issued gratis to architects. Murphy Varnish Co., Newark, N. J.

THE widespread growth of good taste and the resulting benefit to American homes are due directly to the better understanding of interior architecture, decoration and furnishing which now prevails. This diffusion of knowledge has not come of itself, but is the result of years of effort of different kinds; it is due partly to the publication of many volumes dealing with the subject, and perhaps in an equal degree to the efforts of many magazine publishers who have kept up year in and year out a steady campaign of education and who by constantly placing before their readers illustrations of well furnished interiors have at length succeeded in raising the standard of taste of the entire nation. Along with all this a large share of credit for the improved standard is due to the manufacturers of certain commodities which enter into building and furnishing, who, not content with manufacturing excellent materials, have seen the wisdom of showing the public how best to use them.

A notable instance of teaching the public the best use of materials is found in the publication of the two brochures mentioned here. Realizing, perhaps, the need by the public of knowledge regarding the great historic periods of decoration in a form more concise than is afforded by any of the better known manuals, the Murphy Varnish Co. has produced these works, one written for the laity in general and the other for architects and interior decorators. The brochures are written from quite different points of view, that for general distribution being more in the nature of a textbook than would be desired by architects, but both contain analyses of illustrations of excellent old and modern rooms in the various periods, together with illustrations and descriptions of many of the details of furniture and accessories which belong to each period. Both brochures contain period charts which list in the most concise form possible the appropriate treatments, in rooms of different types, of the walls, ceilings, floors, draperies, furniture, lighting fixtures and other details, all this being data which is useful to the laity and even more so to the architect or decorator, and which it is convenient to have in accessible form. The correct treatment of interiors, of course, involves considerable use of stains, varnishes and other materials used for wood finishing in connection with paneled walls, timber ceilings, floors and interior woodwork of other kinds, and a valuable detail of both brochures is the giving upon

ROMANESQUE SCULPTURE OF THE PILGRIMAGE ROADS

By ARTHUR KINGSLEY PORTER

STUDY of the Romanesque architecture of France and northern Spain is closely related to study of the Gothic which rose later throughout western Europe. In all the Romanesque buildings, as with the Gothic, sculpture played a highly important part, and the freshness and vigor of the styles depended in no small measure upon the wealth of carved ornament which adorned the exteriors of churches, cathedrals and chapels, particularly their facades and portals, and which extended to the interiors, especially to such accessories as altars and screens. This astonishing flowering of the sculptor's art was the direct outgrowth of the travel which during the eleventh and twelfth centuries went on to and from the shrines which attracted religious pilgrimages.

"Adoration of the Magi"
La Charite-sur-Loire, Nievre

IN this magnificent work the author records in a wealth of halftone illustrations the present state of the Romanesque sculpture of the religious buildings of southern France and northern Spain, while in the accompanying text he traces the beginning and rise of the Romanesque school and describes the various types which became identified with different regions, giving detailed information and the dates of most of the pieces illustrated. There are few works on sculpture which are more helpful to the architect who would be accurately posted as to the sculpture and ornament of this important epoch, or to the student who is concerned with the study of sculpture and its important influence upon the development of the different architectural styles.

Ten volumes; one of text and nine of half tone illustrations. 6½ x 9 ins. Price $150 net

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several pages of information in the form of specifications by which the various finishes can best be used to produce the effects demanded in carrying out the styles.

ASPECTS OF THE ITALIAN RENAISSANCE. By Rachel Annand Taylor. 302 pp., 5¾ x 8½ ins. Price $3. Houghton Mifflin Co., Boston.

THE marvelous period of the renaissance has engaged the thought and skill of writers for centuries, and yet each additional work upon the topic presents the subject in a light which lends to it a new interest and fresh importance. Because the movement was far more than merely artistic, and because it extended into the realms of science, philosophy, religion, and in fact into every department of effort, its influence upon the world was profound, and it may almost be said that there are as many different views of the renaissance as there are individuals who have studied it.

Perhaps it is because this fascinating work is not exactly historical that it presents an aspect of the history of the renaissance which is fresh and new. It is the fruit of deep study and exact erudition, and from her point of view Mrs. Taylor throws her searchlight through the darkness of past centuries and focuses it as it were upon many a cross-section of the life of the period. It would be quite possible, of course, to disagree with many of her presentations of facts and therefore with the conclusions which she draws from such presentations, but one is not likely to withstand the force of the arguments which are based upon these premises. For example: "So, while the states consolidated, Italy dreamt on, dependent on her mercenaries, till she fell before a lower type. This refusal to become a nation till so late in the history of Europe has been urged against her in every note of reproof and deprecation; yet that refusal was to our eternal advantage. Through the chaos of the internecine wars of renaissance Italy, the 'scheme and equilibrium' of western Europe slowly declare themselves, say the historians, with cheerful conviction that the change is from evil to good. But are 'scheme and equilibrium' good in themselves to any but formalists? The period of conflict and 'chaos' is the age of painting, sculpture, literature, architecture, a scenic public life and a complicated personal existence unequaled in the history of the world. That little states are more favorable to the development of human charm and intelligence than great nations seems an obvious enough moral. France, as a congeries of little kingdoms, Spain when it was many Spains, the Empire when it was a welter of small princedoms, were all great and fruitful in the things that justify humanity. England as merely England, Scotland as Scotland, Ireland as Ireland, wrought out their several tempers in priceless individual forms of expression, as now they cannot do. The mass of the people suffered from the violence of wars, but perhaps not more than they endure from the greed of capitalists. 'Scheme and equilibrium' seems to end merely in a deadly uniformity that impoverishes the capacity of the human race and encloses in hidden places the undying art which expresses human difference, in a dull national ideal of bulk sustained by a military and naval parade, wearisome and meaningless to the last degree—the cowardly ostentation of defence where there is little to defend. The 'Great War' unlike all other wars, since chemistry and machinery made it more an illimitable massacre than a war, has left us exhausted and cynical, and as yet without vision, inclined to mock at national aspirations which must require at least a century or two to materialize. The League of Nations may be a fantasy of individual persons; a league of definite nations might be desirable. One could always trust humanity to make certain that it would not be a league of nations conforming to one pattern. Ghastly, unspeakable as future conflict in Europe must be, the peoples have not settled their differences, and councils seem more futile than ever. It is possible that the spirit of democracy may protest: 'Give the workers their birthright, and let them live amicably, though diversely.' Even then, one who is both democrat and historian, stoically admits that perfect peace may have its losses. Human genius often finds its most astonishing expressions in an atmosphere of strife. However, the dangers of perfect peace are as yet exceedingly remote."

It would be easy to quote endlessly, in fact the temptation must be resisted again and again, but anyone who values the architectural and artistic character of the renaissance is not likely to demur when she says: "The arts and crafts kept their dignified ways through all the din of battle and the sack of cities, enriching the world with workmanship both superb and sincere, for it was constantly required of them, and, whether in war or peace, their doings lay in a great sunlight of approval. The still poorer sort endured, suffered, were ravaged by famine, sack and pestilence; yet were succoured by many guilds and brotherhoods with sacrificial tenderness; yet found life sweet in the sun, had much laughter

Farmhouses, Manor Houses, Minor Chateaux and Small Churches

From XI to XVI centuries in Normandy, Brittany and other parts of France

With a Preface by Ralph Adams Cram, F.A.I.A.

THE glories of old French architecture include far more than the Gothic cathedrals and the renaissance chateaux, for some of the most beautiful buildings in the world are the village churches and wayside chapels of France and the smaller domestic buildings of different kinds which abound in the rural districts and small towns.

For the architect whose work includes country or suburban residence work no more helpful book could be imagined, for these old French buildings with their incomparable grouping, besides affording practical precedent for modern use, were developed in materials easily had today in almost any part of the United States.

New Edition, 8 x 11½ ins., 94 pages, almost entirely illustrations. Price $10

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NEW YORK CHICAGO PHILADELPHIA

and horseplay and festival, and were leavened by romantic hopes now long ravished from them. It is to be repeated that in that age of *virtù*, courage might make a peasant's son a condottiere, and a duke, a liveliness at his letters, a scholar for whose presence cities wrangled, a sense of fair colors and exquisite shapes, an artist for whom princes disputed. At the worst, they had their pleasures in the spectacle, their joy in the drama of existence so ignored by the modern reformer, who thinks man lives by brown bread and eugenics alone, and cannot understand why the stair of a slum courtyard may lead more directly to the palace of rapture than the porch of a garden city. Besides, every child born in a city of renaissance Italy entered into a heritage of visible beauty, which quickened the pulses day by day, a life of processions, festivals, public squares, made marvelous by the greatest genius the place could buy, for it was not yet an era when the people could be put off with trash. They moved freely in the august presence of great art, for bad art had not yet been invented."

There are not a great many works even upon as absorbing a topic as the renaissance which one reads again and again, but however well read one may be upon the period, this volume requires that it be studied more than once. It is a work which suggests many other volumes, each developing some thought gathered from its pages.

STRUCTURAL MEMBERS AND CONNECTIONS. Compiled by a Staff of Specialists; Editors-in-Chief, George A. Hool and W. S. Kinne. 611 pp., 6 x 9 ins. Price $6. McGraw-Hill Book Co., Inc., New York.

THE structural engineers' handbooks which have been issued in Mr. Hool's name or of which he is author in collaboration with others have been found invaluable by a wide circle of architects, engineers, builders and students. Each of the volumes, covering widely different phases of construction engineering, is a unit in itself since references are not made from one volume to another by section and article number. This arrangement permits of the use of any one of the volumes as a textbook in schools and colleges without the use of any of the others. While not an elementary work on the subject of connections or structural members, this book covers its field fully and with admirable clearness. Its usefulness is by no means confined to students, for with its carefully compiled tabulations of data it is well adapted for use in the office of any architect, engineer or builder, where work involving structural members and connections would naturally be done.

A MONOGRAPH OF THE WORK OF MELLOR, MEIGS & HOWE. With a foreword by Owen Wister. 212 pp., 12 x 16 ins. Price $20, net. Architectural Book Publishing Co., New York.

DURING the last 15 or 20 years the American suburban and country house has been in a state of evolution. Various types and styles have had their day and have either been discarded as wanting or else modified into forms which are appropriate for present-day use, and along with all this trial, modification and gradual fusing of types there has come what might be called a typical American domestic style, typically American since it fails to agree definitely with any of the existing styles. This type is as composite in an architectural sense as the American nation is racially and politically; it includes elements from many widely different sources, but in its best aspect these diverse elements are modified, adapted, fused and toned down, and the result is architectural coherence and dignity. Moreover, it will be found by anyone who for some years has followed the progress of American suburban and country house work that many of the better known architectural offices have developed what might be called styles of their own, which possess certain marks or mannerisms by which a careful and critical observer could tell, almost invariably, a building designed in one office from another building in some other.

Few offices where domestic architecture is chiefly followed have been more successful than that of Mellor, Meigs & Howe. Philadelphia, as is well known, is a city possessed of excellent taste; in no department of taste is the standard higher than in what pertains to architecture, and in a special sense to domestic architecture, and among the Philadelphia architects this firm has during many years occupied an honored place. In this volume there is presented a kind of review or summing up of the work—or much of it, at least—which has been done from this office. The buildings are chiefly of a domestic nature, although there are examples of what is not strictly residence architecture, such as farm buildings and one or two clubs or college fraternity buildings. Of materials used there are many—brick of numerous kinds, wood used in various ways, stucco, and particularly the stone which abounds in the neighborhood of Philadelphia and which Philadelphia's architects and builders use with such excellent results. The structures illustrated and described are also of widely differing sizes; some of the work is of modest extent, but whether large or small it is distinguished by the care and thought which make the work of this firm notable.

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THE LAW OF CITY PLANNING AND ZONING. By Frank Backus Williams, A.M., LL.B. 738 pp., 5¾ x 8½ ins. Price $5. The Macmillan Company, New York.

WHAT is generally known as "city planning" is something comparatively new in America. If we except Washington, which was laid out from the beginning by L'Enfant upon a definite plan, it will be found that all American cities are the result of more or less haphazard growth. Boston, indeed, or at least the older part, presents a puzzling arrangement of streets which are said to have been originally cowpaths, and even Washington, which as just said was definitely planned, has departed materially from the spirit of its original plan in that for the new portion use has been made of the "gridiron" plan, which represents America's chief contribution to the planning of cities. This does not mean that vision, enthusiasm or skill are entirely unknown in America where the planning of large urban areas is concerned. One could readily call to mind a number of instances where noble plans have been made, but almost invariably these plans have had to do with cities already well built up so that considerable change would be necessary to make the plans possible, and in the vast majority of instances where such plans have been made upon anything more than the most minor scale the projects have gone no further than the stage where they are shown upon diagrams and in beautiful renderings of possible vistas.

Mr. Williams in this interesting volume points out the fact that most of the city planning movements were concerned primarily with parks, civic centers and other specialized features which, however excellent in their way, fulfilled only a narrow purpose too often totally unrelated to the city as a whole, and that it was not until later that the less showy but fundamental questions, such as transportation, water supply, sewerage and the like were considered as essential parts of civic improvement. Even then the reports or projected plans only too often illustrated and laid great emphasis upon city embellishment without making due allowance for local conditions, and particularly for the legal status of city planning. Upon the legal status the feasibility of such a venture often depends, and as we recall a number of interesting and ambitious schemes for civic betterment in many places it is quite apparent that the legal aspects of it all received little attention, if indeed they even entered the minds of the promoters.

As a lawyer and a member of the New York bar, Mr. Williams recognizes the weakness and superficiality of so much of this visionary planning; he also points out the fundamental principles of the legal aspect of city planning or re-planning and goes with helpful detail into the subject. Much of the legal side has to do with the condemnation of private property for public uses, based ordinarily upon what is known as the "right of eminent domain." The invoking of this right is not always understood, and much difficulty would be avoided if those interested in city betterment would familiarize themselves with this vitally important subject. The taking over by national, state or municipal government of property required for public uses is by no means new nor is it confined to America, and this book by summing up the laws prevailing in different countries where much public improvement has resulted from their use goes far toward making plain a somewhat puzzling subject. As the title of the volume implies, it also contains a review of building regulation and zoning, particularly as it applies to city planning.

PRACTICAL ACCOUNTING FOR GENERAL CONTRACTORS. By H. D. Grant. 254 pp., 6 x 9 ins. Price $3, net. McGraw-Hill Book Co., New York.

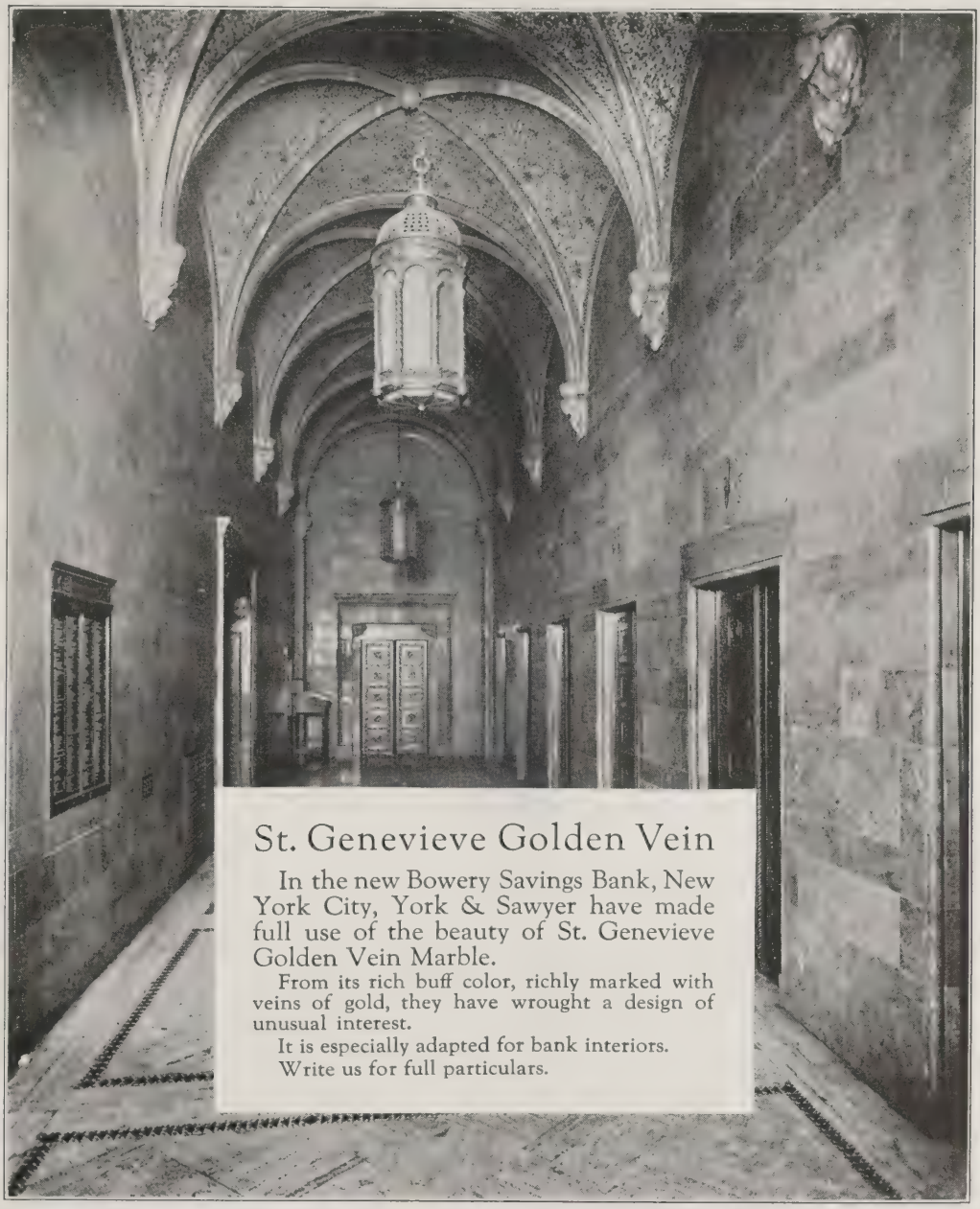
THE business of general contracting is filled with a multiplicity of detail that demands careful and exact accounting. The main or home office is likely to be merely the chief of many places of operation, for usually there are as many sub-offices as there are different works in progress, and the accounting and finances of these branch offices must be co-ordinated with the activities of the home office as parts of the whole. Then there are countless details arising from the relations with sub-contractors who are often employed by general contractors, and all this, together with relations with clients, constitutes a business which is far more complex than might appear to one not familiar with its intricacies.

This carefully considered and well written work is the outcome of long experience in accounting and auditing for various types of business and of study and special research in the field of contracting. The author is a member of the staff of W. B. Richards & Co., accountants and engineers, and was formerly auditor of the Hudson & Manhattan R. R. Company and treasurer of L. K. Comstock & Company, electrical engineers and contractors. The volume is designed to aid the contractor in co-ordinating and controlling all his operations so that expense and income in connection with his contracts can be ascertained at all times, and that at any moment it will be possible to judge of the condition of the business. The work is divided into three parts. Part I is a sound and thorough treatment of financial accounting at the home office; Part II covers field cost accounting, while Part III deals with payroll problems, the control of equipment, preparation of estimates and bids, and the legal aspects of contracts. It is a volume which will be of great value to any contractor, particularly to the man concerned not so much with details of business getting or even of actual construction as with the underlying problems of a financial nature.

THE BOOK OF BUILDING AND INTERIOR DECORATING. Edited by Reginald T. Townsend. 104 pp., 9¾ x 12¾ ins. Price $2, net. Doubleday, Page & Co., Garden City, N. Y.

THE pages of many of the magazines carry each month a wealth of material which is of permanent value to architects and interior decorators. This material is sometimes preserved in scrapbooks or portfolios, and occasionally it is reprinted, and in book form is assured of preservation.

This volume is a selection of matter which has already appeared in *Country Life in America,* the selection being made from among the illustrated articles on building, decoration and furnishing which have appeared during the last year or so. The selection includes illustrations and plans of houses, small as well as of medium size, and all the popular types are represented. Toward the end of the volume there appear a number of articles by Charles O. Cornelius upon different phases of furnishing, and these pages are of interest and value to the ever-increasing number of students of the period styles.



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THE ARCHITECTURAL FORUM

VOLUME XXXIX NUMBER 4

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ALBERT J. MacDONALD, Editor

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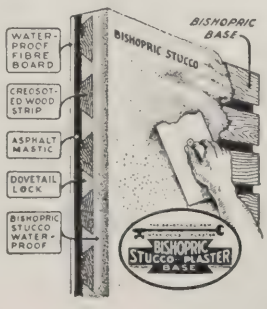

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THE EDITOR'S FORUM

A NEW PROFESSOR IN DESIGN

THE College of Architecture of the University of Michigan announces the appointment of Eliel Saarinen, of Helsingfors, Finland, as Visiting Professor in Architectural Design for the scholastic year of 1923-1924. He will criticize in advanced and graduate design.

To students of European architecture, Mr. Saarinen has long been known as an architect of unusual ability. In the international competition held in 1906 for a design and plans for the Peace Palace at The Hague, his design was among the most noteworthy submitted and was included in the volume which was published to sum up the results of the competition. His later architectural work has been marked by the same spirit and originality which characterized his early efforts, and in addition to designing important structures in his own country, he has been active in the field of city and town planning. Mr. Saarinen is chiefly known to Americans, of course, in connection with the unusual and masterly design which he submitted in the competition for the building projected by the Chicago *Tribune*, and his connection with an American school of architecture should exert a stimulating influence upon the development of design in this country, especially in connection with large buildings.

FIRE-RESISTIVE HOUSES A REALITY

QUOTATION is made of a few paragraphs from an address delivered by Wharton Clay, Architectural Engineer, at the First National Fire Prevention Congress, held in New York, October 8 to 13.

"If an architect and engineer and a criminal incendiary should get their heads together, they could hardly devise a better construction for rapid destruction by fire than the present residence or apartment building with lumber joists, studs and ordinary lath. Even the plaster, which is incombustible itself and would be considered a fire protection of high order, aids in making a series of chimneys to aid in the draft, and when this plaster is installed, as is customary, the entire interior of the chimney is lined with small pieces of rough wood easily ignited, and which communicate a fire with incredible speed throughout the structure. This does not mean that lumber must be eliminated to make houses fire-safe, but to make them fire-safe the lumber must be protected in a manner different from the present custom, and the myriad of small pieces of wood must be eliminated.

"It seems strange that the design of fire-resistive construction should have started at the top and worked downward to the residence. It is strange that city ordinances give more consideration to the protection of the lives of transients within their boundaries living in hotels than is given to their own citizens whose lives are in constant peril in houses that strictly conform to all the laws. It is strange that a man will demand a fireproof vault to store a few bonds and stocks, some of which prove to be worthless sheets of paper, and at the same time will leave home light-heartedly with his dearest possessions soundly asleep in a tinder box, which, on the slightest spark, will in a few moments be hopelessly involved in a rapidly enveloping fire. In fact, the modern house, if constructed scientifically at all, is constructed to permit the most rapid spread of flames that possibly could be arranged.

"Lumber construction, because of its great strength, ease of cutting and fitting and the familiarity of the workmen with it, is the most economical material on the market today with which houses can be constructed. Attempts have been made to produce fire-resistive houses with other materials, but they have always ended in financial disappointment because of the extra burden it places upon the home owner.

"Metal lath as a protection for lumber solves the problem as no other material does. It does not change our habits of constructing the building, it does not hamper the speed of erection, and it does not add greatly to the cost. It even lessens the burden on the pocketbook of the householder, because it reduces the depreciation and upkeep expense cost to a greater extent than it increases the original investment. For over 30 years, expanded metal lath has been known to the general building public as a fire-resistive material. Notable examples of its fire-stopping qualities have appeared from time to time. On the other hand, hundreds and even thousands of houses constructed in the ordinary manner burn down yearly, and we thoughtlessly let them pass without inquiring into the basic reasons why houses should be so rapidly consumed and take with them so many precious lives.

"The true measure of the fire-resistive value of expanded metal lath as a protection for wood was not known until a short time ago; but on the anniversary of Fire Prevention Day, 1922, the Underwriters' Laboratories announced that a wood-studded partition plastered on both sides by metal lath and plaster, and an ordinary wood-stud floor as commonly constructed, but protected on the under side with metal lath and plaster, would resist the intense heat of their standard fire test for over one hour and remain intact and carry its load beyond that period. Shortly thereafter, they announced that ordinary lath and plaster would expose the wood behind it, under the same conditions, in about four minutes. Here, then, lies the secret of the immense life and fire loss in residence construction."

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The
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VOLUME XXXIX OCTOBER 1923 NUMBER 4

The Development of Charleston Architecture

PART I. DWELLING HOUSES

By ALBERT SIMONS

IT has long been realized by historians and critics of early American architecture that there is preserved at Charleston, South Carolina, and on the outlying plantations a wealth of material that would be of the greatest value if recorded in some comprehensive form before it inevitably disappears. Much has already been investigated and much published, but a great deal of importance has been of necessity ignored, and the whole subject requires classification in regard to sequence. Already, in the comparatively short span covered by the memory of the writer, much of irreplaceable value has been wiped out. It is quite beside the mark to wax sentimental about this loss, for it cannot reasonably be expected that any community can continue to be satisfactorily housed in its obsolete past, no matter how splendid that past may be. That so much has persisted to our day should be a source of gratification to all students of the days of the colonies and of the early republic.

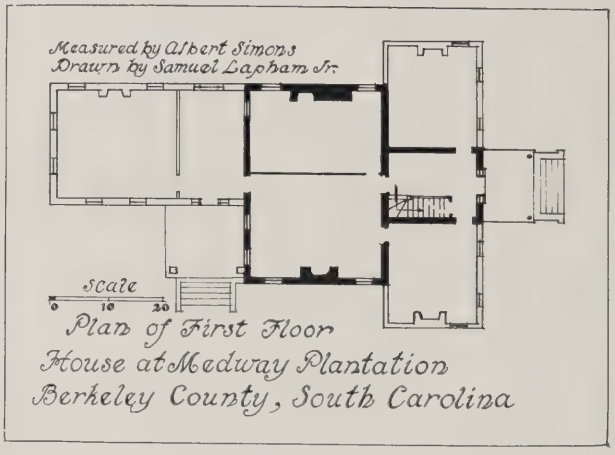
However, it is important to preface any discussion of old Charleston dwelling houses by stressing two qualifying facts. First, that although great numbers of the earliest settlers in Carolina were French Calvinists or Huguenots, there is but scant evidence of direct French influence in the manner of building in colonial times. Of course England, like the rest of Europe in the eighteenth century, patterned its architecture as well as its etiquette after that of France, so that whatever elements may appear to be French came by way of England first, as may readily be observed by a glance at contemporaneous English work. However, it cannot be denied that this French strain in the people of early Carolina manifested itself in the tendency to build in a monumental way, whenever the means were available. The second fact to be borne in mind is that the buildings that have survived from colonial times are not nearly so old as might be expected from the date of the first settlement under the lords proprietors. This was in 1670, on the west bank of the Ashley river, at Albemarle Point. Ten years later the site of the present city, on the peninsula between the Ashley and the Cooper rivers, was finally selected as being more readily defended from hostile attack.

In 1682 we read that "the town hath about one hundred houses, all of wood, though here is excellent brick made, but little of it." (Salley's "Narratives of Early Carolina," quoted in Smith's "Dwelling Houses of Charleston.") The prevalence of wood construction, combined with a series of destructive fires that swept the city at intervals between 1698 and 1740, has made it well-nigh hopeless to search for any houses that can be positively proved to belong to the seventeenth or the early eighteenth century. Probably the only seventeenth century dwelling surviving from Carolina's settlers is the house at Medway Plantation, on the estate of Mr. Samuel Gaillard Stoney. This house appears to have been built about 1682 by Jan d'Arsens, Seignior d'Weirnhout, whose widow later married Landgrave Smith, governor of the Province of Carolina. A glance at the plan will indicate how successive wings have been added through many generations, but the original structure is obviously of the seventeenth century and shows a striking resemblance to Bacon's Castle, Surrey County, Virginia, built about six years previously.

There is convincing evidence to sustain the claim that the Colonel William Rhett house was built previously to 1722. Although now in the midst of the city, it was then on a plantation well outside the bastions. On the walls of the drawing room, over the mantelpiece and doorways, are rocaille decorations executed in plaster on paneling marked out in plaster. The character of this decoration corresponds with that of other houses of a somewhat later date.

The Colonel Robert Brewton house (before 1733) is a three-story brick building covered with stucco, with quoins of slight projection at the corners, keyblocks over the windows, and a small wrought iron balcony under the middle window of the second story. The very adequate cornice is worked out in moulded brick, and the hip roof is covered with clay tiles of double curvature. There

Colonel Robert Brewster House (before 1733)



Plan of Oldest Surviving Carolina House

is no direct entrance from the street but through the piazza on the side. This piazza and those at the back are quite casual in their architectural treatment and are doubtless later additions to the house.

There are four houses that can be definitely classified as belonging to the years between 1740 and 1760. They are the George Eveleigh (1743-1753), Boon (1740-1749), Thomas Horray (1751-1761), and Ralph Izard (before 1757) houses. Besides these there are one or two others whose dates cannot be as definitely determined except within the range of several years; but all have certain features in common. They are built with rather thick brick walls, covered with stucco and sheltered under high-pitched hipped roofs. Unlike the later houses, the first floors are raised only about two feet above the grade. When piazzas occur, they appear to be often considerably later than the houses. Absolute symmetry does not always obtain, as the entrance or a balcony may occur to the right or left of the center. All the principal rooms are paneled throughout, except in the stair halls above the wainscots. Mouldings are bold and simple, and where the original mantelpieces have been preserved, there is comparatively little carved ornament. There are two

Corner, Thomas Horray House (1751-1761). Center, Robert Pringle House (1774)

Old Stone Houses

small stuccoed houses to the southwest of St. Philip's Church that from their appearance seem to belong to this or perhaps an earlier period. They are of interest as being probably the only houses remaining that are built of Bermuda stone. Early records show that this stone was brought in as ballast and was sometimes used in erecting dwellings, as well as for fortifications and sea walls.

From 1760 to the revolution we find a number of houses built with considerable magnificence, reflecting the growing prosperity of the colony. To this group belong the William Huger (about 1760), Miles Brewton (after 1765), John Edwards (1770), Colonel John Stuart (1772) and Robert Pringle (1774) houses, as well as several others whose character places them in this period although their dates cannot be determined. The feature of all these houses that is most admirable is the great elaboration and very excellent quality of the interior woodwork and carved decoration. The detail preserves a consistent sense of scale throughout and shows an inspiration similar to the rocaille compositions illustrated in Swan's "British Architect." The Miles Brewton house is too well known to architects to require any comment here, but this

Courtesy, J. B. Lippincott Co.

Mantel in John Stuart Drawing Room

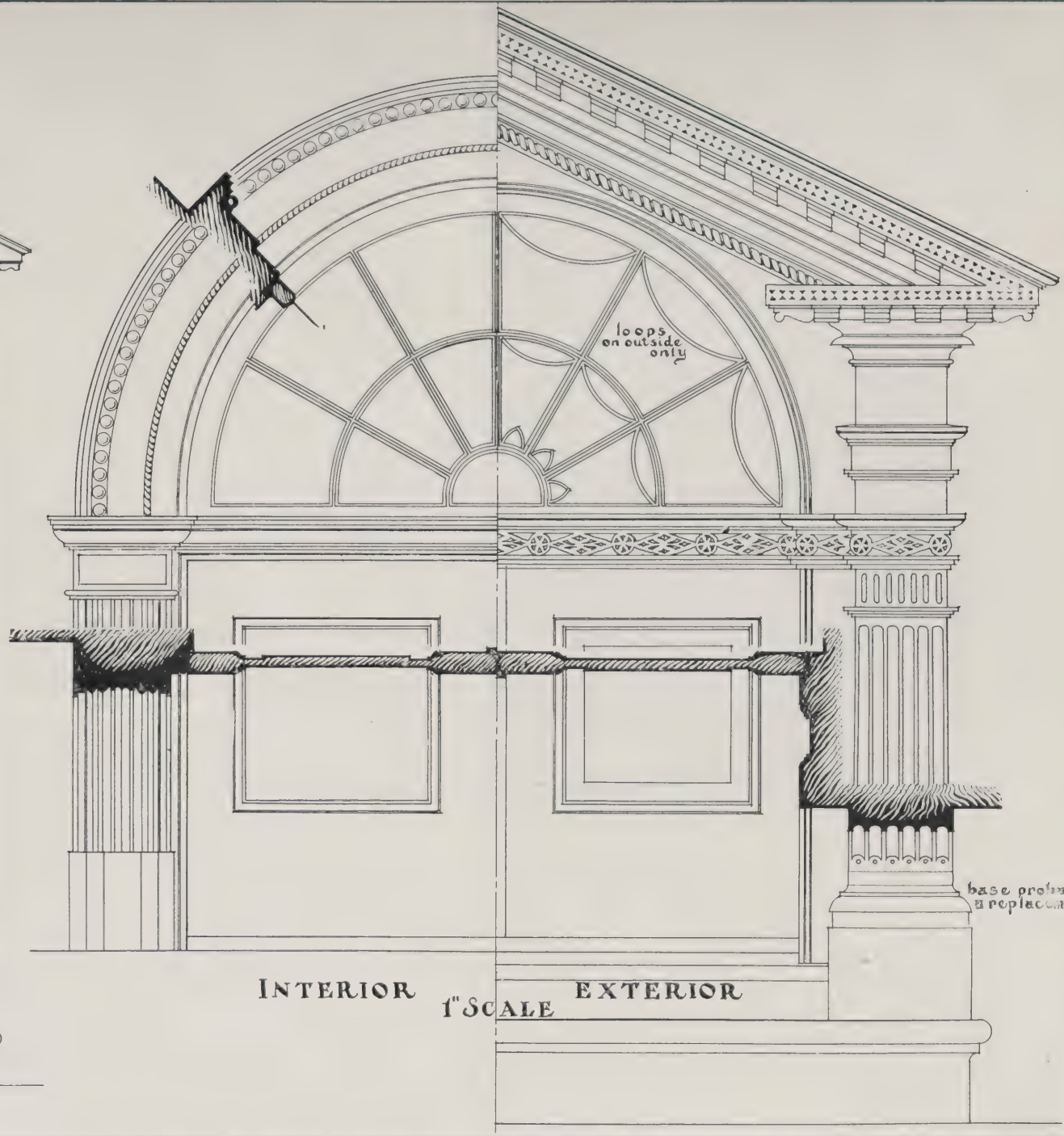
Ralph Izard House (before 1757)
This view shows the typical walls and gates at the street line

PORCH SIDE OF DOORWAY

STREET SIDE OF DOORWAY

DOORWAY DETAILS, MAGWOOD HOUSE, CHARLESTON, SOUTH CAROLINA

FRONT ENTRANCE
½" SCALE



INTERIOR EXTERIOR
1" SCALE

MAGWOOD HOUSE, CHARLESTON, SOUTH CAROLINA

NUMBER 39 SOUTH BATTERY NOW THE RESIDENCE OF MR. HENRY TRESVANT WILLIAMS

MEASURED AND DRAWN BY
ALBERT SIMONS
JUNE 1923

advertisement in the *South Carolina Gazette and Country Journal** of August 22, 1769, is of interest in indicating the extent of the services performed by the "architect" of that day:

"Architecture
"Ut rest gesta est Narrabo
Ordine

"Ezra Waite, Civil Architect, House-builder in general, and Carver, from London, Has finished the Architecture, Conducted the execution thereof, viz; in the joiner way, all tabernacle frames, (but that in the dining room excepted), and carved all the said work in the four principal rooms; and also calculated, adjusted and draw'd at large for to work by, the Ionick entablature, and carved the same in the front and round the eaves of Miles Brewton, Esquire's House on White Point for Mr. Moncrieff. If on inspection of the above mentioned work and twenty-seven years experience, both in theory and practice, in noblemen and gentlemen's seats, be sufficient to recommend; he flatters himself to give satisfaction to any gentlemen, either by plans, sections, elevations or executions, at his house on King Street, next door to Mr. Wainwrights' where architecture is taught by a peculiar method never published in any book extant.

N. B. As Miles Brewton, Esquire's dining room is of a new construction with respect to the finishing of windows and doorways, it had been industriously propagated by some (believed to be Mr. Kinsey Burden, a carpenter), that the said Waite did not do the Architecture, and conduct the execution thereof. Therefore the said Waite, begs leave to do himself justice in this public manner, and assure all gentlemen, that he the said Waite, did construct every individual part and drawed the same at large for the joiners to work by, and conducted the execution thereof. Any man that can prove to the contrary, the said Waite promises to pay him One Hundred Guineas, as witness my hand, this 22nd day of August, 1769.

Ezra Waite."

"Veritas Odium Pavit."

*From The *South Carolina Historical and Genealogical Magazine*, quoted in Smith's "Dwelling Houses of Charleston."

Maison de Cadet Roussell, Rennes, France

Some of the same decorative motifs found in the Miles Brewton house occur again in other houses of this period, so it might be supposed that Waite and his colleagues enjoyed a flourishing practice there as architects.

After the revolution houses depart more and more from the established types and exhibit a greater variety of plan and exterior treatment. One feature becomes more in evidence, and that is that piazzas or open galleries, extending the entire length of the house on the south or west sides, and of several stories, are now a more integral part of the house. The piazza should be differentiated from the more restricted entrance portico which was designed for architectural effect and not primarily to shade the interior. That piazzas of one story above a basement were built on plantations before the revolution seems probable; but the larger town houses of colonial times

Missroon House (between 1789-1795)

Josiah Smith House (1800)

seem to have been without them. It has been suggested that these double- and triple-decked galleries were introduced by the French refugees from the revolution in Santo Domingo, who sought asylum in Charleston in 1793. Certain it is that these galleries bear considerable resemblance to such vernacular forms as are found in the "Maison de Cadet Roussell," at Rennes, where timber construction prevailed. That piazzas soon became an essential element is evidenced by this comment in the "Travels of the Duc de la Rochefoucault-Liancourt in 1796": "Large galleries are formed to shelter the upper part of the house from the force of the sun's rays, and only the cooling north-east wind is admitted to blow through the rooms."

From the early days of the republic we have quite a number of interesting houses to select for study. The Missroon house (between 1789-1795) is perhaps among the earliest post-colonial houses. The street facade bears an interesting resemblance to the Bingham house, Philadelphia. The detail of the mantelpieces and doorways is in the typical Adam manner, which now became the vogue, and is further exemplified in such splendid mansions as the Radcliffe-King (1806) and the Nathaniel Russell (before 1811) houses. Many of the mantels of this time are enriched with classic figures, after the manner of Flaxman, that occur in contemporary houses in Boston and Philadelphia. Whether these were made by Robert Wellford of Philadelphia or were manufactured by some local dealer or were imported from London is still a subject for more research and investigation to determine.

The Joseph Manigault house (1790-1797) is one of the few houses whose architect is known, it being the work of Gabriel Manigault; and in its plan it displays very clearly the architectural preferences of the day. The southern piazza is obviously later, as the detail is greatly inferior to that of the segmental portico on the west. In the Josiah Smith house (1800), now the Charleston Club, we see how the entrance portico on the east was later supplemented by piazzas on the south, with Doric orders of the Greek revival. In the William Mason Smith house (1820) we find the first signs of the Greek revival, manifested in the mouldings of the cornice and in the Greek orders employed in the triple-decked piazzas. The house is interesting for the manner in which on the street façade the end of the piazzas on the south is masked

William Mason Smith House (1820)

Jenkins Mikell House (after 1853)

Elias Vanderhorst House (after 1832)

behind a masonry wall, repeating that of the stair hall on the north, lending an architectural air.

In the Elias Vanderhorst house (after 1832) and in many others we find the piazzas extending across the street front when the width of the house faced south, so that the desired symmetry is obtained without effort. The Charles Alston house (1838) has perhaps one of the most charming side piazza developments, and the intersection of the roof and cornice with those of the house is more successfully accomplished than in most cases.

The use of the colossal order extending through two stories does not seem to have been generally favored, and it occurs on comparatively few houses; the order from the "Temple of the Winds," Athens, seems to have been usually preferred in such cases. However, in the Jenkins Mikell house (after 1853) we find a Roman type of Corinthian order, the capitals even having rams' heads at their corners.

The destruction of wealth that came with the war of secession and with the subsequent years of "reconstruction" arrested local architectural development at a time when American architecture had strayed into devious paths, so that today there are few important houses of the later Victorian era.

The problem of the architect, practicing in Charleston today, is to provide homes that will conform to the modern standards of comfort and convenience and will at the same time conform in character to the quiet dignity and charm of their venerable neighbors. That a similar problem has been confronted and solved successfully by many of the profession in Boston, Philadelphia and Baltimore, where modern homes of a distinct local character abound, proves that it is not unreasonable to hope for a revival of Charleston architecture.

Charles Alston House (1838)

Period Finish for Wood and Plaster

IT may be said that the basic elements of interior design and decoration for period rooms consist of form, finish and furnishing, which includes the use of decorative fabrics. Form is expressed architecturally by the proportioning of line and mass in accordance with precedents established during the various periods, such as the seventeenth and eighteenth century Italian, Tudor and Jacobean, Queen Anne, Adam, and similar historical divisions of architecture and decoration. Similarly, furnishing and the use of decorative fabrics are based upon original conceptions of the various periods. All of these have been thoroughly expounded in text and illustration, and there is available a great store of printed information covering the design and furnishing of original period rooms and modern rooms adapted from these periods.

It is interesting to note, however, that the third important element, which we have termed "finish" and which includes painting, staining, gilding and other forms of wood and plaster finish in period rooms, while highly important, is comparatively a mystery to architects and almost all others except those craftsmen-painters who are qualified by experience and study to actually perform this work. While it may be fully realized how important a contribution wood and plaster finishes render in the decoration of a period interior, it is certain that there is very little information available as to how such effects are actually obtained and how these effects may be reproduced in modern rooms of period design. The soft, rich brown of the woodwork of the Italian renaissance; the painting and glazing of plaster walls in such rooms; the gilding and coloring of carved work, and similarly, the different finished effects demanded for various period rooms are appreciated by architects, but the method of obtaining such finishes or approximating them in modern work is not usually understood.

It is certain, nevertheless, that with a better understanding of the actual methods employed in obtaining the various necessary finishes of woodwork and plaster walls in period rooms, the architect would be in a better position to direct the efforts of decorative painters and to thoroughly appreciate the integrity of workmanship and the skill of the craftsmen required to perform high class work of this character. With an understanding of the methods employed, it is also possible in less expensive work to fairly approximate results on a basis of economy where sufficient funds are not available to carry out this work in its more perfect form. This article will therefore consist of a brief treatise on the actual methods of obtaining various plaster wall and woodwork finishes which are recognized as important elements of period interiors. For the bulk of information contained in this article we are indebted to Luigi Borgo, an artist-craftsman and decorative painter of the old school whose long experience and study in Europe and in this country have rendered him a practical authority on the subject. Much of the fine work done in recent years in this country is attributable to his skill and that of his associate, Morris J. Gunn. In studying the information presented in these paragraphs it will be remembered that while exact methods are described, it is impossible to define in print that craftsmanship which is the final element of all mixtures and methods of application in work of this character.

Finishes of the Italian Renaissance

The characteristic wood finish of the Italian renaissance period is the soft, rich brown with an eggshell gloss used on walnut ceilings, doors and other woodwork. There are two general methods used in obtaining this finish:

1. A penetrative stain is first applied to the wood. This must be a water stain for penetration. If a high degree of penetration is not required an oil stain may be used. These stains are obtainable as commercial mixtures, in which case a walnut stain would be used for this finish or stain may be mixed by an experienced painter, in this instance using a mixture of Van Dyke brown and negrosene. The first coat of stain having been applied, it is followed by a thin coat of shellac or varnish as a medium to bring out the color. If the wood requires a filler, this is put on after the stain, rubbing with steel wool between and finally applying two coats of wax, well rubbed. Careful rubbing has a great deal to do with the finish.

2. The second method uses the first coat of stain as already indicated, but instead of following with a coat of shellac, two coats of rubbing varnish are applied, the last coat being rubbed to an eggshell finish by the use of powdered pumice stone and water, rubbed with a piece of felt. (Sold as stick-felt).

Walnut, oak and mahogany all require fillers, and birch and maple, being close-grained, require none. Some painters, however, make a practice of using fillers on all woods where the work is of a particularly high class nature. At this point it might prove interesting to present some information regarding wood fillers and their use as recently prepared under the direction of the International Association of Master House Painters and Decorators of the United States and Canada. The general consensus of opinion by the membership of this organization is that open-grained woods like oak, chestnut, ash, walnut and mahogany require a paste filler to fill the open pores between wood fibers. Close-grained woods such as maple may require the use of a liquid filler or shellac to accomplish the same purpose.

Without fillers varnish coats put on to new woods sink in, giving a pitted effect. Of course if enough coats of varnish are put on and sandpapered the pores of the wood would finally be filled level enough to avoid the pitted appearance, but obviously it is

cheaper to put on a filler coat. Birch, while classed as a close-grained wood, takes a better mahogany finish if it is filled with a paste filler, instead of with a liquid filler. This filler brings out the grain and figure contrast best.

Paste fillers are mixed after many different formulæ. Manufacturers also supply such fillers ready to use in paste form, and they require only a little thinning with turpentine or benzine to make them ready for use. Most of the wood fillers today are those prepared ready for use by manufacturers. The prepared wood fillers come in natural color (or transparent), oak, golden oak, antique oak, mahogany and walnut colors. It is well, however, for the painter to know what composes a good filler,—and how to mix it himself when occasion requires it, or when there is advantage to be gained in cost in doing so. Fillers are usually colored to tone in with the natural color or the stained color of the wood to be filled. There are exceptions to this rule, and often a novelty effect is wanted. A black filler is sometimes used to make mahogany finish darker; to gain a gray effect on light colored woods, white filler is used, and also on gray stained woods. Colored fillers are used on natural finished woods, too.

Many materials are used as a basic pigment for fillers. Some of them are: whiting, clay, corn starch, and barytes. None is quite so good as silex when it is very fine,—the water floated grade is best. Silex is silica, a white, transparent, inert sand resulting from crushing quartz rock. It will not bleach out in the grain of the wood, and will not shrink nor bulge out. It is fairly transparent and is easily colored. A mixed paste filler may be made by approximately this formula:

3 pints pure raw linseed oil;
2 pints Japan drier,—not too dark in color;
Enough very fine silex to make a stiff paste.

Grind this mixture through a hand paint mill for thorough mixing. It can be mixed in a pot with a paddle, using extra care, if the silex is very fine. When the filler is to be kept on hand for some time in kegs or cans, the silex may separate from the liquid. To prevent this the paint manufacturers add cornstarch to the extent of from 10 per cent to 20 per cent of the weight of the silex, or they add up to 25 per cent of asbestine (silicate of magnesia) to keep the silex in suspension in the liquid. To make this stiff paste filler ready to use the painter thins it a little with turpentine, but only as much as is absolutely necessary to permit brushing it into the pores of the wood. It is used much thicker than paint.

The color of this paste is correct for some woods to be finished in the natural colors, but for others and for stained woods it should be colored according to these directions, using preferably dry colors, although oil colors can be made to serve. To stain first is the high class method, but these mixtures are used over oil stains, almost always with good results. Great care should be taken with fillers.

Antique Oak
2 lbs. thick paste filler;
½ to 1½ oz. burnt Turkey umber.

Antwerp Oak
2 lbs. paste filler;
2 oz. drop black.

Antique Mahogany
2 lbs. thick paste filler;
1½ oz. burnt Italian siena;
½ oz. Van Dyke brown.

Antique Mahogany (Very Dark)
2 lbs. thick paste filler;
½ oz. burnt Italian siena;
½ oz. rose pink;
½ oz. drop black.

Mahogany, Light
2 lbs. thick paste filler;
1½ oz. burnt Italian siena;
½ oz. rose pink.

Forest Green
2 lbs. thick paste filler;
6 oz. drop black;
1 oz. Van Dyke brown;
½ lb. dark chrome green.

Fumed Oak
Usually this finish is not filled, but when it is varnished and filling is called for mix in this way:
2 lbs. thick paste filler;
4 oz. Van Dyke brown;
2 oz. burnt umber.

Mahogany on Birch Lumber
2 lbs. thick paste filler;
2 oz. rose pink;
2 oz. Van Dyke brown;
⅛ oz. drop black.

Bog Oak
2 lbs. thick paste filler;
½ lb. Van Dyke brown;
4 oz. drop black.

Early English
2 lbs. thick paste filler;
4 oz. drop black.

Flemish Oak
2 lbs. thick paste filler;
1 oz. Van Dyke brown;
1 oz. burnt Turkey umber;
4 oz. drop black.

Ebony
2 lbs. thick paste filler;
1 oz. drop black;
⅛ oz. Prussian blue.

Golden Oak
2 lbs. paste filler, thick;
1 oz. Van Dyke brown;
2 to 4 oz. black asphaltum.

Rosewood
2 lbs. thick paste filler;
1 oz. burnt siena;
¼ rose pink;
⅛ oz. drop black.

Walnut
2 lbs. thick paste filler;
1½ oz. burnt Turkey umber.

The paste filler, as has been said, is to be thinned to heavy brushing consistency with turpentine. Then with an old short bristle stiff brush lay the filler on and rub it well into the open grain of the wood. Brush the filler *crosswise* of the grain first and finish up by laying it off as smoothly as possible *with* the grain—the same way as the grain runs. The best filler sets, but does not get hard dry, in from 15 to 20 minutes. When it has set hard enough to hold fast to the wood—when the coat looks flat and the gloss has disappeared—wipe off the excess filler, using a piece of burlap or machine waste. If the filler is permitted to set too long, it may not be possible to wipe off the excess material at all. Then it must be sandpapered and scraped,—not an easy task. If the filler is wiped too soon, it comes out of the pores of the wood and the purpose is defeated. After filling and wiping, allow the surface to dry at least 12 hours; 36 hours' drying will prove of considerable advantage. Then the filler is harder and more firmly anchored in the wood.

For extra fine work a second coat of the same filler mixed, possibly, a little thinner, is put on in the same manner and wiped off. That will surely fill the wood level and avoid varnish's "pitting," as the painters call it, when it sinks into the wood pores.

Next fill all holes, nail holes, cracks and joints with putty colored with dry colors to match the filler. Let it dry hard before sandpapering. (The method known as "sparkling," described later, is better for high-class work.)

Liquid fillers are sometimes simply paste fillers made thinner with turpentine or benzine. More often, however, shellac, a coat or two, serves as a liquid filler, and it is sandpapered down to remove all except that which fills the wood pores. Liquid fillers are made in many ways. Those made from cheap resin varnishes, such as gloss oil, hard oil, sealing varnish and suction varnish, are not satisfactory because they turn white, are too brittle and cloud the finish. A formula commonly used successfully is:

2 gals. pale interior varnish of good quality;
2 qts. turpentine or benzine;
1 qt. Japan drier, light in color;
5 lbs. well dried bolted China clay;

Mix the clay with a little of the varnish and run it through a hand paint mill. Then add the balance of the liquids.

In Italian interiors the wood ceilings are sometimes decorated in color. This is done by the use of water colors, oil paints, or by tempora. (Tempora will be explained later). Water colors with wax finish constitute the cheapest method. Oil paints have a tendency to blacken with age, and consequently their use is not so popular. The third method is that known as the tempora color method. In using the first method the first step is to stain the wood in the desired background color. The second step is to apply the outline of design, which is done with pin-pricked patterns, after which the required design is painted on in water colors. When these have dried the entire surface is carefully waxed and rubbed in two coats. If oil paints are used for this work it is highly important to use basic colors which will remain unchanged for the longest possible period. The decorative effect is obtained by the use of complementary basic colors rather than by color mixtures which tend to fade and blacken.

The term "tempora" as applied to the use of color in decorative painting involves the use of some specially prepared medium which will hold the colors fast and form a permanent bond in applying them to the wood or plaster. On wood ceilings the method which is most satisfactory is the use of tempora in which the first coat is a priming coat consisting of thin glue (mixed 1:6) and whiting (lump white), a material known to the Italians as gesso. Over this priming coat is then placed the background coat which is a tempora medium. The old method favored by Italian craftsmen is to mix egg yolk,vinegar and varnish in equal parts and to add the necessary amount of dissolved dry color to give the required color tint to the background. Another mixture which is used as a tempora medium is that of glue and glycerine with necessary coloring added. When this background coat has been completed and dried the outline of design is applied as just described

Dining Room, House of W. T. Grant, Esq., Pelham, N. Y.

Howard Major, Architect

and various colors are painted on, still using the tempora medium. Finally, the entire work is waxed and rubbed once or twice.

Finishing of plaster walls is complicated but very interesting. There are several general systems involved: (a) oil colors; (b) tempora colors; (c) *affresco,* and here are given descriptions of each of these methods:

(a) Oil Color Finishing for Plaster Walls. The first step is to apply three good coats of white lead and oil. The first coat is allowed to dry for two days. This coat is put on fairly thin to avoid brush marks. The second coat is put on to a painting consistency, and the third coat has more turpentine, together with an amount of coloring made in accordance with the desired color tone. There is then applied a fourth coat consisting of a mixture of zinc and enamel in equal parts and in the desired color. Then comes the important finishing step which is that of glazing. Glazing consists of applying a mixture which is a compound of turpentine, oil and varnish in approximately these proportions: 1 qt. turpentine; ½ cup oil; ¼ cup varnish.

The oil is in this mixture for the purpose of keeping it soft while working. The varnish is included in order to hold the glaze and to prevent its rubbing off by cleaning or by accidental contact. In order to give the desired antique effect this glaze is rubbed lightly in all directions with cheesecloth before it has completely dried.

(b) Tempora Colors. The use of tempora colors for plastering finishing is the least expensive method. The plaster is prepared by the mason and has a sand finish. The first step of the painter is to prepare the surface with a priming coat of gesso (whiting) and glue approximately 1:6. The next coat is a mixture of gesso and glue with the color introduced, and when this is completed the wall is finished for all modern requirements. If an aged effect is desired, a glaze mixture is applied in two coats consisting of wax, turpentine and color and applied as before described. The wax is used in this mixture for its quality of waterproofing.

There is an alternate method and one which is less expensive which gives a beautiful antique effect. In this method the plaster is sand finished as before, and two coats of paint are put on using complementary colors. For instance, if the color is to be cream, the first coat is pink; for blue, the complementary color is yellow; and for green, the first coat is red. In mixing these colors they are toned to the same approximate coloring, and the finish coat is put on evenly but allowing the complementary color to show through in a texture of brush markings or stippling. These colors are used in a tempora medium.

(c) Affresco. The *affresco* system of mural decoration has been is use for many centuries in Italy, and its proper application requires the work of true craftsmen, usually with inherited qualifications and knowledge. There are two types, the first, known as *affresco secco,* and the second as *affresco buono.*

Affresco secco is carried out on a dry surface which may be a Keene cement or a very good plaster finish. The priming coat used is a mixture of lime water and milk. The next coat, which is the background coat, consists of a mixture of lime and milk with color added to get the required shade. All color must be used in very liquid form. The lime which is used for this work must be wood-burned lime and must be well slackened. Few people know how to slacken lime for a use such as this. Proper slackening is carried out by adding water slowly and in true proportions so that the mixture will at no time boil or burn. After this slow slackening process is carried out the lime should be stored for at least one year and preferably for two years or more. In Italy the master craftsmen of this trade maintain stores of lime which are often many years old and pass down from father to son.

For making this background mixture the lime is strained in order to take out any lumps or foreign matter and mixed to the desired thickness with a liquid consisting of one-third milk and two-thirds water. Color is also added for the desired shade. The reason that milk, buttermilk or casein is used in this mixture is because lime mixed with animal matter has a tendency to petrify and become stone-like so that the completed job is permanent in character and holds color excellently. When the background coat is completed and dried, any required design or mural decoration is applied in the same medium. The final finish of this work to get the antique effect is the application of a coat of milk and water proportioned 1:2 or 1:3 rubbed with a chamois skin, or the application of a coat of wax glaze well rubbed.

The use of this final glazing coat is customary for practically all types of fine interior finishes. The effect obtained consists of emphasizing texture, toning down colors, and pulling together in a semblance of age the various decorative elements introduced in the different finishing stages.

The more interesting *affresco* method is that known as the *affresco buono.* The medium which is used to carry the color is a mixture including two parts of well washed white river sand and one part of lime as already described. The selection of sand is very important. In Italy a special kind of sand, particularly well adapted for this purpose, is known as *pozzolana.* If beach sand is used, it must be thoroughly washed, as the presence of salt is fatal to the result. Certain well qualified painters use marble dust instead of sand, but this must be done with great care and thorough understanding of the medium.

Before applying *affresco buono* it is important that the base of plaster upon which it is to be applied be strong and safe against cracking, bulging or other disturbance. In the Italian method where it is desired to apply *affresco buono* the mason will build up

several coats of mortar over a brick wall. The first coat he applies vertically; the second coat in horizontal strokes; the third coat in diagonal strokes, and similarly to a total of four or five coats. When this mortar surface, or any other properly prepared surface, is finished, it is ready for the application of *affresco* in the mixture already described. Into this mixture is introduced no color as the background color is painted on and colored by the artist if mural decorations are to be applied. The first coat is put on about ⅛-inch thick, and the design is worked in rapidly in colors as it is necessary to bring this work to a stopping point before it can dry and allow crystallization of the lime which will not hold or take color. It is customary, therefore, to prepare ahead only as far as the artist can work in a day. A joint is made for proceeding next day, and any undecorated surfacing coat is cut off. It is not advisable to work over the colors in this type of decoration. In fact, the secret of good work is to carry it out quickly and accurately so that it is not necessary to go over the same color twice. Lime water or milk of lime (*latte di' calce*) is a diluting medium in this color work.

Library, House of William Fahnestock, Katonah, N. Y.
Charles A. Platt, Architect

Another method of finishing plastered walls which is occasionally employed in Italian interiors is the use of leather. This leather is in plain colors or sometimes illuminated and is applied with a glue (probably Venetian varnish). The surface of the leather is then shellacked two coats and the glaze applied with a mixture of wax, turpentine and any desired color. Another interesting feature of Italian rooms is the occasional marbleizing of the wood bases and trim around doors. This marbleizing is done in the usual way, requiring good craftsmanship in the application of oil paints. The colors of the marble are selected and painted on in two or three coats. Blending is carried out by rubbing of the brush to simulate the marble figure. Finally, two good coats of varnish are applied and well rubbed. The results of this process may be noted in columns used in the Commodore Hotel, New York. These are plaster columns decorated in an excellent imitation of Cipollino marble.

Another wall finish in which interest has recently been expressed in this country is that known as the "spattered" wall. This can be simply explained. Quite often when a peasant in Italy paints his house he will first whitewash it, but not being satisfied with the effect he obtains pots of paint in two or three colors and dipping a large brush in the paint he will grasp the brush halfway up the bristles and drawing back the ends release them to throw the paint in irregular spots over the surface of the wall. This may be done in one color or a mixture of several colors, providing a surface of unusual texture and color.

The gilding and coloring of carved woodwork is a difficult process when properly done. The first step is to apply one coat of the liquid mixture of gesso and weak glue. (Whenever this priming coat is used it is applied very warm). A second coat

is then applied, but the glue is made stronger. A third coat is applied of the same mixture but with the glue weak again. Then a fourth coat is applied, the same as the second coat, continuing alternately until six or eight coats of this priming mixture have been built up. After these coats have dried the surface is carefully sandpapered, and all edges, undercutting and interstices are carefully tooled to their original sharpness and shape. The next step is to put on what is known as *bolo*, consisting of a mixture of glue and rosin or sometimes shellac brought to a sticky consistency so that it will dry very hard, and brought to a reddish color by the use of burnt siena. This coat is allowed to dry and assumes a very hard surface. A coat of gold sizing is then applied. The sizing is obtainable commercially, and if real gold is being used for the decorative work, slow-drying sizing should be applied at night. In the morning this sizing will be found slightly tacky, and at that time the gold leaf is put on and worked into cracks and around edges with a small brush. After drying completely the gold is burnished and glazed. Often some coloring matter is put in the glaze, and if lighter spots are required on projections, these are obtained by rubbing before the glaze dries.

A cheaper method of obtaining gold finish would eliminate some of the coats of priming material and would employ commercial gold (Dutch metal). Here the process of application is the same, except that Japan sizing is used and after the Dutch metal coat of gilding is applied a good coat of varnish or shellac is necessary in order to keep the gold from tarnishing.

For the finishing of ironwork in Italian rooms the original method has been to apply a coat of oil well rubbed in. It is customary also to paint or varnish ironwork, but the unpainted method is usually preferred.

Oak floors are finished by staining in any desired color but quickly wiped off to leave stain in the grain. A filler is then applied which may be a commercial type of oak filler, and for a dull finish two coats of wax are applied over this or a coat of thin shellac and wax. If a high polish is desired this may be had by long and careful rubbing of the wax, or for a gloss finish varnish is necessary.

It may be noted that many woods, even white wood, can be used for trim in less expensive work, and it is possible to finish these woods to resemble walnut. This calls for careful craftsmanship, in the course of which the painter keeps adding glazes and color and rubbing with rotten stone dust to get the desired result.

Tudor and Jacobean Finishes

In Tudor and Jacobean rooms the first subject of interest is the staining and finishing of oak paneling, doors and ceiling timbers to approximate the effect of old work. There were two methods generally used in obtaining these effects, the first of which has a tendency to provide a heavy rich gloss finish, and the second to bring out the graining and texture of the natural wood, enhancing this by a deeper color. To obtain the first result the wood is stained and filled as described in other sections of this article, after which two or three coats of varnish are applied and rubbed until the desired effect is achieved. This rubbing is accomplished by light sandpapering between the varnish coats, and the last coat is rubbed with powdered pumice stone and water or oil and felt. It may be noted here that water is usually preferred with powdered pumice stone on all coats except the finished coat. Generally there is no rubbing between coats except light sandpapering and steel wool for mouldings.

The natural wood finish referred to as the second method may be desired in a light shade of the natural wood color, or it may be better to obtain a darker, richer effect. To bring out the natural beauty of the wood without darkening it noticeably the painter first applies a thin coat of shellac which he proceeds to rub down well with steel wool and sandpaper. He then glazes the surface with two coats of a special glaze made up of beeswax and turpentine which is carefully and patiently rubbed until the desired effect is obtained. If the darker effect is desired the first step is to paint on the raw wood a glaze made up of glue, and a little umber of raw siena, the amount of which is obtained by experiment. This mixture is the basis of darkening, and after the surface is sandpapered the next proceeding is to shellac and glaze with two coats of wax and turpentine as already described.

An interesting feature of finishing William and Mary rooms is the method of treating carved surfaces of woodwork, particularly where the carving is deep and of a very delicate nature such as that of Grinling Gibbon. Some of this carving is so delicate that leaves and flower petals are almost entirely detached from the body of the composition. In modern work much of this ornate and difficult carving is really simulated by the use of a composition ornament. We have, therefore, for consideration the finishing of carved natural wood and of composition ornamentation. The first step is to apply a filler of the commercial type known as a paste wood filler. This filler has coloring in it, and it is brushed on and immediately rubbed away *across* the grain so as to leave color in the grain. If a darker effect is desired the filler will be rubbed away slowly *with* the grain so that more color will be taken up under absorption. Fine brushes are used for this work, and it is carried out slowly and carefully so that all surfaces will be properly covered and the final step is to wax and rub carefully. Where ornamentation is made up of composition material, the finish is carried out in the same manner as carved wood is finished except that judgment must be used in coloring the stain. Usually the surface of the composition material is harder and less absorptive than wood.

In rooms of this type the floors generally consist of wide oak boards which are given a high polish and occasionally set with wide joints which are filled with a black mastic compound. These floors are stained, filled in the usual manner and brought to a high polish by rubbing in wax, or a high gloss is provided by the use of varnish in several coats according to the desired effect. The black compound used in filling joints is a commercial mastic compound which is available through the usual market channels.

Queen Anne, Adam and Colonial Finishes

Many interesting problems of wood and wall finishes arise in work of these periods. Perhaps the first of these involves what originated in the Queen Anne period and extended through the Adam era—the use of highly polished mahogany doors. Their finish is approximately that used on fine pianos, and is obtained by first staining to the desired color followed by the application of a filler. Mahogany must be filled well because of the nature of its grain. After the filler is applied three coats of varnish are put on, and the last coat is well rubbed with rotten stone dust or powdered pumice stone and water or oil. For the final finish lemon oil is rubbed over the surface and fanned until almost dry. Then, with a piece of cheesecloth dipped in natural alcohol, this surface is brought to a high polish.

The wood of the walls in this period was frequently of "deal," which is approximated by pine. In the original rooms it was often left in its natural state and ultimately weathered to a beautiful yellow color, and the problem today is to approximate this finish on new wood. This finish is obtained in the manner similar to that used for the natural wood finish in the Jacobean period already described, except that the glaze which is put on raw wood as the first step is colored with siena, umber and a touch of Venetian red, mixed according to the judgment of the painter, and brought to an approximation of color by test application. If it is found that the color of the stain is too deep, this condition may be corrected before shellacking by washing down the surface with hot water, which will tend to lighten the color.

One problem which arises in the course of this work is due to the fact that the pine now obtainable is uneven in the quality of grain and of softness and hardness. In other words, hard spots are encountered, spots where the grain is raised, and the problem is how to treat these spots or sections of pine to provide an even coloring over the surface. In many instances it will be found that the wood is not thoroughly cured and that these spots are sappy. The first step is to lay a coat of shellac over the spots in order to stop the exudation of sap. This is followed by applying a coat of what is known to painters as "sparkle." Sparkle is made up by diluting white glue with warm water and creating a thin mixture having gesso introduced in proportions of about 1:6. Then a small amount of white lead is added and the mixture is stirred into an emulsion in which is placed a small quantity of varnish. This mixture is left in a pail until ready to use, at which time it is thickened with plaster of Paris and laid over the wood evenly to smooth out the rough grain. This is left for two or three days to harden, and is then sandpapered to a smooth, even surface. Sparkle is also used for the purpose of filling in cracks and uneven spots by the same method.

The enamel finishes of these periods are obtained in a rather complicated manner. In order to provide a full body and the proper richness as a basis for an antique effect, usually seven coats over the priming coat are put on in this manner:

First two coats are of white lead and oil.
Third coat, 75 per cent lead and 25 per cent zinc with oil, thinly applied.
Fourth coat, 50 per cent lead and 50 per cent zinc with oil.
Fifth coat, 75 per cent lead and 25 per cent zinc with oil.
Sixth coat consists of one-half enamel and one-half French zinc.
Seventh coat is a full gloss enamel, which is rubbed carefully with powdered pumice stone and water.

It is usually desired to obtain an antique effect on this type of finish. This is done by applying a glaze made up of turpentine, oil and varnish well rubbed in all directions until the desired texture of finish is obtained. Then the surface is rubbed with rotten stone dust or powdered pumice stone and water until the result is satisfactory. This glaze may have a certain amount of coloring matter in it, and color may also be introduced into the seventh coat just described. Very little color should be mixed with enamel, as it has a tendency to spoil the properties of the material.

Where mouldings and carved woodwork are used, it is sometimes desired to leave the round and projecting parts in relief and of a different tone than the background. This is done by applying two coats of glaze as already described. The first coat is light in color, and the second coat darker. While the second coat is still wet it is rubbed off at all points where the lighter color is desired. The same effect may be obtained by rubbing off the first glazing coat, particularly if it contains some color, but the better method is to use two glazing coats. Naturally, this is a somewhat expensive method of finishing, and it may be cheapened by eliminating much of the rubbing which takes time and patience and makes a high labor cost. It is also possible to reduce the number of coats required and to apply the glaze immediately without much rubbing of the final coat.

Occasionally in these rooms the decoration is carried further by the application of gold, bronze or coloring on parts of the mouldings and other carved work. As already said, it is not good policy to mix much color with enamel, and color should never be mixed with varnish as it destroys its flowing qualities. Any desired color should be

put on beneath the varnish, and effects like gold may be used on slow-drying sizing or Dutch metal on Japan sizing. All colored painting and gilding should be done before the final enamel coat or glazing and varnishing are applied. Gilding is done by applying a coat of shellac on the required part after the last coat of paint; then the sizing or gold leaf and Dutch metal is applied. Dutch metal should be shellacked to prevent discoloring.

In these periods, particularly in simple rooms, it is quite popular now to use wall papers of Chinese character with a finish of shellac and varnish. The paper is first applied to the wall, then one coat of shellac is put on to stop suction. The second step is the application of glazing, as already described in previous finishes, and finally a coat of varnish. Any desired color, such as umber, should be put in the glazing rather than in the varnish.

A method of applying color over plastering which insures a permanent freedom from cracking involves the use of a canvas covering for the plaster walls. The material used is raw muslin or one of several canvas materials available under commercial trade names, some of which are obtainable with one coat of paint already on. Sometimes it is desirable for the texture of the cloth to show. Flat paints and mixtures of lead and oil are used in this work, and coat after coat is added (usually two or three coats) until the texture disappears completely.

An interesting enamel finish which is gaining some popularity at the present time has the familiar appearance of a Chinese crackle vase in which tiny hair cracks develop all over the surface, providing a certain texture pattern. This result is obtained by first putting on a coat of sealing varnish, then, before the varnish dries, it is painted with a flat color coat. Before this second coat dries it is painted with another flat coat. If this is done it will be found that after drying well hair cracks have developed all over the surface. A final coat of glazing brings out these cracks in the desired pattern.

Another interesting glazing finish, which is particularly adaptable for colonial rooms, presents a two-tone effect. This is obtained by working two colors together in this manner: The glazing mixture is prepared as already indicated, and one part of it is colored with raw siena and chrome yellow and the other part is colored with blue, chrome yellow and siena. These two colors of paint are worked together by painting one spot on the wall with one mixture and immediately next to it another spot with the other mixture, varying the sizes of spots. While wet these are rubbed together with cheesecloth, working in all directions so that the two-tone effect is brought out. Floors in these periods are finished in the usual way, and after the surfaces are painted they are usually protected by waxing or by varnishing in accordance with the finish desired.

In this article we have attempted to cover most of the usual finishes for wood and plastering as required in the period rooms. Naturally, special problems will develop, and architects who wish specific information on any particular method of finishing will receive the necessary information by addressing the Service Department of THE ARCHITECTURAL FORUM, 383 Madison avenue, New York.

Dining Room, House of Harold Carhart, Esq., Glen Cove, N. Y.
Howard Major, Architect

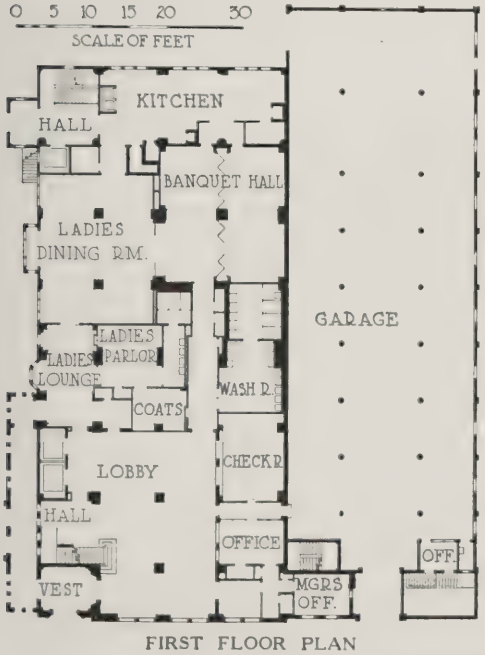
UNIVERSITY CLUB BUILDING, LOS ANGELES
ALLISON & ALLISON, ARCHITECTS

ENTRANCE TO CLUB

ENTRANCE TO GARAGE

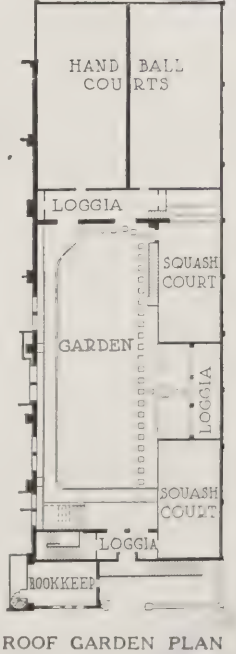
UNIVERSITY CLUB BUILDING, LOS ANGELES
ALLISON & ALLISON, ARCHITECTS

LOUNGE WINDOWS OVERLOOKING ROOF GARDEN



FIRST FLOOR PLAN

SECOND FLOOR PLAN



ROOF GARDEN PLAN

UNIVERSITY CLUB BUILDING, LOS ANGELES

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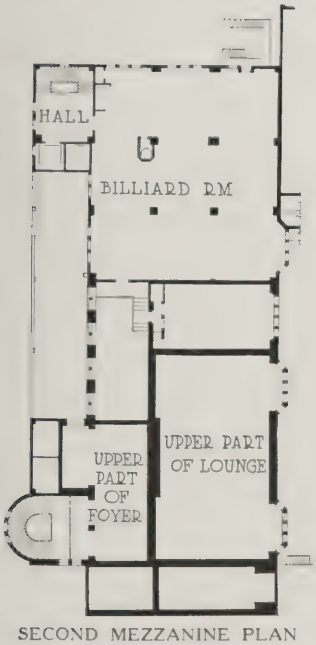
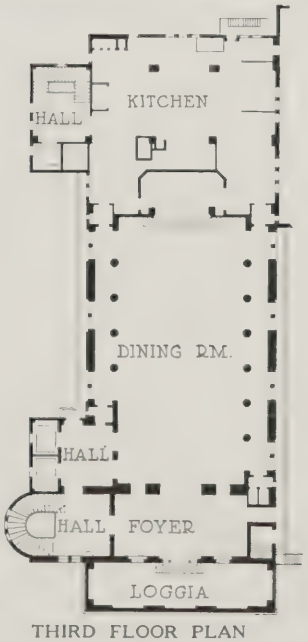
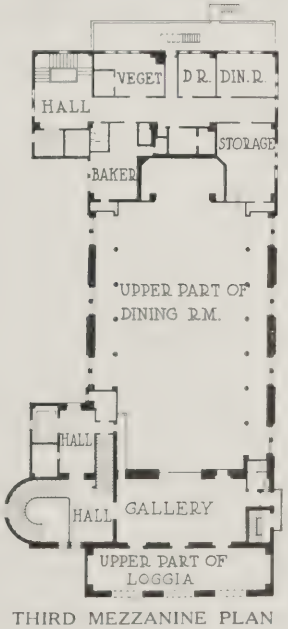
MAIN DINING ROOM



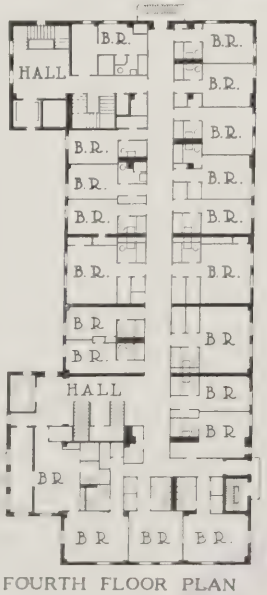
SECOND MEZZANINE PLAN



THIRD FLOOR PLAN



THIRD MEZZANINE PLAN



FOURTH FLOOR PLAN

UNIVERSITY CLUB BUILDING, LOS ANGELES

ALLISON & ALLISON, ARCHITECTS

DETAIL OF MAIN DINING ROOM
UNIVERSITY CLUB BUILDING, LOS ANGELES
ALLISON & ALLISON, ARCHITECTS

STAIRCASE IN FIRST FLOOR LOBBY

SILENCE ROOM OPENING FROM LIBRARY

UNIVERSITY CLUB BUILDING, LOS ANGELES

ALLISON & ALLISON, ARCHITECTS

SECOND FLOOR STAIR HALL

DOORWAY TO LIBRARY FROM LOUNGE

UNIVERSITY CLUB BUILDING, LOS ANGELES

ALLISON & ALLISON, ARCHITECTS

END OF LIBRARY

MANTEL IN LOUNGE

UNIVERSITY CLUB BUILDING, LOS ANGELES

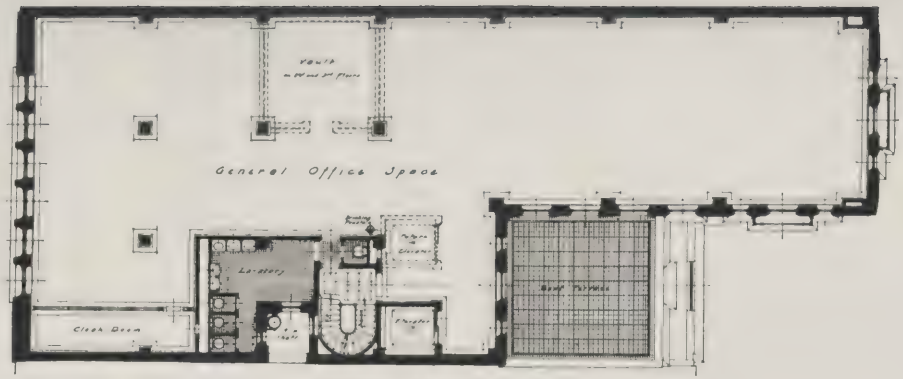
ALLISON & ALLISON, ARCHITECTS

BEAVER HALL SQUARE FACADE

BUILDING FOR CRANE, LIMITED, MONTREAL

HUGH VALLANCE, ARCHITECT

UNION AVENUE FACADE



TYPICAL FLOOR PLAN

SECOND FLOOR PLAN

FIRST FLOOR PLAN

BUILDING FOR CRANE, LIMITED, MONTREAL

HUGH VALLANCE, ARCHITECT

DETAIL BEAVER HALL SQUARE ENTRANCE

VIEWS OF SHOWROOMS

BUILDING FOR CRANE, LIMITED, MONTREAL
HUGH VALLANCE, ARCHITECT

ENGINEERING DEPARTMENT

Charles A. Whittemore, *Associate Editor*

Electric and Hydraulic Elevators in Modern Buildings

By JAMES A. McHOLLAN
Vice-president, The R. P. Bolton Company, Engineers

INASMUCH as the successful operation of large buildings depends to a great extent on proper elevator service, the selection of elevator equipment is of primary importance. After construction is completed it is seldom practicable to modify the equipment to meet unforeseen requirements of service. Information is presented in this article on some of the latest improvements in electric elevator equipment, together with operating records from existing plants, and these may be of assistance to architects and engineers in planning elevator equipment. Another problem in elevator work frequently arising in existing buildings is the question of replacing hydraulic elevators with electric cars, and comparative cost figures are given in detail which may aid in advising building owners on this important subject which often comes up for study.

The figures given here show the travel, in miles, of elevators over extended periods, and in conjunction with accompanying tables they may serve as an aid in gauging the extent of service which may be expected in proposed installations. Buildings in which the elevators are worked beyond their normal capacities greatly exceed in number those equipped with a surplus of cars. The density of the rush hour traffic is likely to be underestimated, and for this reason the diagrams A, B, C and D have a special interest. The number of passengers carried per hour is shown, and the variations in up and down traffic can be easily traced to the normal habits of building occupants and visitors.

The electric elevator has been subject to many improvements in the past few years. One of these is a system of control known as the multi-voltage, which improves the smoothness of operation, and by eliminating the losses involved in the ordinary meth-

TABLE I

ELEVATOR MILEAGE AND POWER USED BY ELECTRIC ELEVATORS IN LARGE BUILDINGS

I—16-sty. Office Building — Volume 1,960,300 cu. ft. — Area of Plot 13,800 sq. ft.
Number of Elevators, 4

	Period of test	Car miles	Kw. hrs.	Kw. hrs. per car mile
Elev. 1	23 days	320.8	1490	4.64
" 2	23 "	335.6	818	2.44
" 3	23 "	295.7	790	2.67
" 4	23 "	245.5	818	3.33

II—10-sty. Office Building — Volume 1,561,000 cu. ft. — Area of Plot 12,200 sq. ft.
Number of Elevators, 3

	Period of test	Car miles	Kw. hrs.	Kw. hrs. per car mile
Elev. 1	28 days	61.8	252	4.08
" 2	28 "	74.0	297	4.02
" 3	28 "	82.3	330	4.01

III—22-sty. Office Building — Volume 12,000,000 cu. ft. — Area of Plot 47,000 sq. ft.
Number of Elevators, 16

	Period of test	Car miles	Kw. hrs.	Kw. hrs. per car mile
Elev. 1	42 days	547.9	2420	4.42
" 2	42 "	564.7	2250	3.98
" 3	42 "	758.6	3100	4.09
" 4	42 "	920.5	2920	3.17

IV—15-sty. Office Building — Volume 5,344,000 cu. ft. — Area of Plot 30,900 sq. ft.
Number of Elevators, 12

	Period of test	Car miles	Kw. hrs.	Kw. hrs. per car mile
Elev. 1	7 days	77.7	368	4.74
" 2	7 "	77.6	305	3.95
" 3	7 "	75.4	313	4.15
" 4	7 "	66.8	264	3.95
" 5	7 "	29.2	123	4.21

V—7-sty. Hotel — Volume 1,867,000 cu. ft. — Area of Plot 26,400 sq. ft.
Number of Elevators, 4

	Period of test	Car miles	Kw. hrs.	Kw. hrs. per car mile
Elev. 1	19 days	259	643	2.48
" 2	19 "	263	761	2.89
" 3	19 "	109.6	276	2.52
" 4	19 "	78.0	233	2.99

ods of control effects considerable economy in the consumption of current. This system does away with the usual resistance control for governing acceleration and retardation, and substitutes for it a method by which the same result is obtained through the use of a series of voltage steps permitting the direct application of voltages of 60, 120, 180 or 240 volts to the elevator motors. This is accomplished by installing a compensating set which floats on the main supply lines, the set delivering power to the individual elevator controllers at the voltages mentioned. Operating on the standard voltage of 240 when running at speed, the elevator motors are thrown directly across the various voltage steps during acceleration and retardation, reducing the current losses to a minimum. This system also has the advantage of reducing peak load effects on the supply lines, a consideration of some importance where energy is purchased on a demand basis.

TABLE II

HOURLY VARIATIONS IN ELEVATOR TRAVEL IN 400-ROOM HOTEL, VOLUME 2,600,000 CUBIC FEET, AREA OF PLOT 12,500 SQ. FT.

	Miles Per Hour			
Hour	Car 1 Passenger	Car 2 Service	Car 3 Passenger and Service	Car 4 Passenger
10 a.m.—11 a.m.	1.77	1.31	1.54	2.25
11 " —12 "	1.18	1.33	1.02	1.12
12 noon— 1 p.m.	2.19	1.74	2.12	2.31
1 p.m.— 2 "	1.9	1.4	1.77	2.01
2 " — 3 "	1.65	1.78	1.92	1.65
3 " — 4 "	1.01	.85	.82	.5
4 " — 5 "	1.80	2.05	1.57	1.5
5 " — 6 "	1.75	1.34	1.36	1.51
6 " — 7 "	1.87	1.14	1.74	2.45
7 " — 8 "	1.4	1.05	1.52	1.61
8 " — 9 "	1.29	.46	1.1	1.39
9 " —10 "	1.22	.37	.73	1.36
10 " —11 "	.95	.6	.52	1.27
11 p.m.—12 midnight	1.36	....	.86	2.23
12 mid.— 9 a.m.	2.32	3.17	2.9	6.02
9 a.m.—10 "	1.5	1.32	1.43	1.43
Total miles for 24 hrs.	25.16	19.91	22.92	30.61

Total miles in 24 hours for 4 elevators, 98.60

TABLE III

PASSENGERS CARRIED AND ROUND TRIPS PER HOUR IN 20-STORY OFFICE BUILDING. VOLUME OF BUILDING 1,500,000 CUBIC FEET—AREA OF PLOT 6,400 SQUARE FEET

5 Elevators in operation

Hour	Up and Down Trip	Passengers Carried Up	Passengers Carried Down	Total	Average Number of Passengers Up Per Trip	Average Number of Passengers Down Per Trip
8— 9	72	232	169	401	3.22	2.35
9—10	120	574	252	826	4.80	2.10
10—11	118	413	329	742	3.50	2.79
11—12	96	410	381	791	4.26	2.97
12— 1	120	458	536	994	3.81	4.46
1— 2	120	500	449	949	4.16	3.74
2— 3	108	566	417	983	5.25	3.86
3— 4	96	372	319	691	3.89	3.32
4— 5	120	336	427	763	2.80	3.56
Total	970	3861	3279	7140		
Average					3.98	3.38

Another of the more recent developments that has added much to the ease and precision of operation is the application of micro-drive self-leveling equipment to high speed elevators such as are used in the larger buildings. One of the most troublesome features of elevator operation, involving both danger to passengers and wastefulness of power in operation, has been the difficulty of making exact floor landings. The ordinary elevator operator is very likely to stop a high speed car some inches above or some inches below the floor level, necessitating the repeated restarting and stopping of the car to improve its position; and even then it is not infrequently left slightly off the floor level, and the passengers are subjected to the hazard of tripping on entering or leaving. With the micro-drive, all this is eliminated. Each elevator drive is equipped with a small auxiliary motor which is automatically thrown into operation when the car is about to make a landing and, operating at slow speed, brings the car to the exact floor level. Not only this, but through an ingenious arrangement of contacts it holds the car there against any tendency to creep.

In addition to the saving in power through the lack of "jockeying" at the landings, it will be appreciated that considerable time is saved by the micro-drive. This is due partly to the elimination of time lost by the operator in the attempt to make landings, and partly to the greater speed with which passengers can be loaded and unloaded when the car is always at the exact floor level. This method has made it unnecessary to employ highly skilled operators, as the average operator can readily land the car well within the micro zone, which extends from about 16 to 18 inches above the floor to the same distance below. Within this zone the micro-drive motor takes charge of the operation and automatically makes the landing.

This system is well adapted to push-button control, and one of the largest of New York's sky-scrapers is to be thus equipped. By means of a special controller, the closing of the shaft doors will start the elevator, acceleration up to full speed being accomplished automatically. Stops will be made for discharging passengers through the use of push-buttons within the car, the automatic control and micro-drive motor again bringing the car to the exact level of the desired floor. Passengers wishing to board the car at any floor will simply press a button, and the car, without any action on the part of the operator, will stop at the floor level. When the car is carrying its full complement of passengers the operator will press a button which clears his car of all calls, transferring them to the next car going in the same direction. It is obvious that the adoption of refinements such as these must add definitely to the renting possibilities of any high grade structure.

Another notable, although not so recent, advance in elevator design has been the introduction of the V-groove or single wrap drive for gear-driven machines up to 400 feet per minute. With this drive the hoisting cables bend only a part of one turn over the top of the drum. A direct driving lead is thus obtained, wear and tear on the cables is greatly

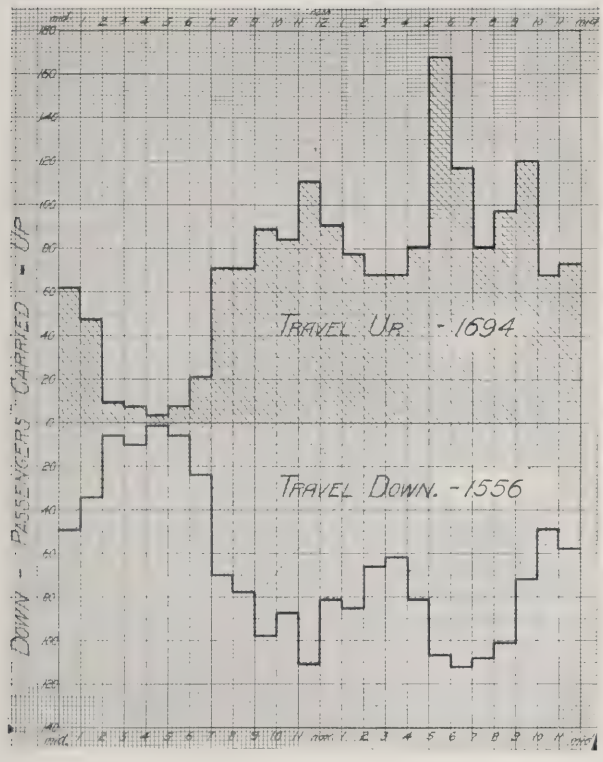


Diagram A, showing passenger traffic in elevators; 3 passenger cars—2 freight cars

lessened, and the power used per elevator car mile is reduced. In locating elevator machines and control boards, it is always desirable to place these at the top of the shaftway. In this location the elevator cables last longer, and it makes unnecessary the use of basement space for housing the machinery. In preliminary estimates of installation costs, care should be taken not to overlook the cost of providing the supporting steelwork for the machines and for the enclosing penthouses and skylights with screens on top. The cost of such work varies widely, often being as high as 30 per cent of the cost of the elevator, guides, rails, and the usual shaft equipment. This item may be even more expensive in the alteration of an old building, and the inexperienced engineer or architect is apt to be confronted with unexpected items of expense in elevator alterations.

The question of what should be done about the replacement of hydraulic elevator equipment in buildings erected some years ago, when machines of this type were the best obtainable, is one that presents itself with greater and greater frequency as time passes. The electric elevator has so clearly established its superiority that it may safely be assumed that practically every new elevator installation will be electrically operated, but whether the time has come, in connection with any specific instance, to discard the old hydraulic equipment for new electric machines, involves a number of considerations that require careful study. Until the advent of the gearless traction electric the hydraulic elevator was quite generally selected for higher class buildings, but the safety features, speed, ease and accuracy of control and relatively low initial and operating costs of the electric have definitely given it the first place.

If in any building the existing hydraulic machinery is worn out, or substantially so, or is giving service that is inadequate for the needs of the building, then the problem of whether or not to electrify is simplified—it becomes largely a question of whether the property owner is willing or able to make the investment necessary properly to maintain his building at the standard required by its character and income-producing qualities. On the other hand, in the building where the hydraulic equipment is not antiquated, has been well kept up, and is giving fairly satisfactory service, the problem is one requiring skillful analysis if the best course is to be determined, the main consideration being the effect of the proposed change on the operating expenses of the property. A study of this kind is complicated by the fact that hydraulic elevator operation is so closely tied in with other building services that it is impossible to segregate various cost items, which must necessarily be allocated by some method

The accompanying diagrams—A, B, C, and D—show the passenger travel per hour in a 300-room hotel, Volume 3,000,000 cu. ft. Area of Plot 13,400 sq. ft. 3 passenger, 1 freight and 1 service elevator.

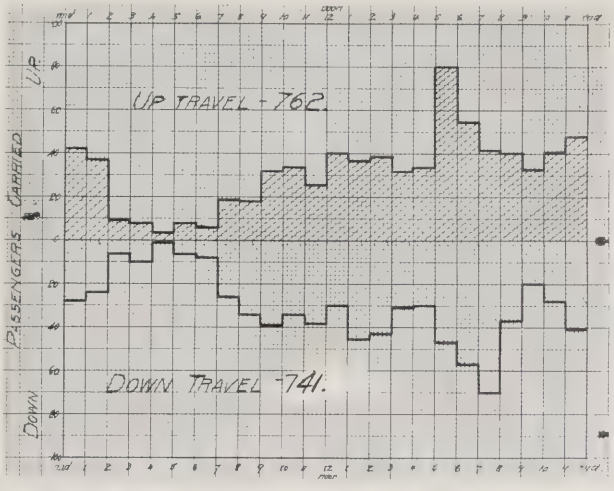


Diagram B, showing passenger elevator traffic; 3 cars

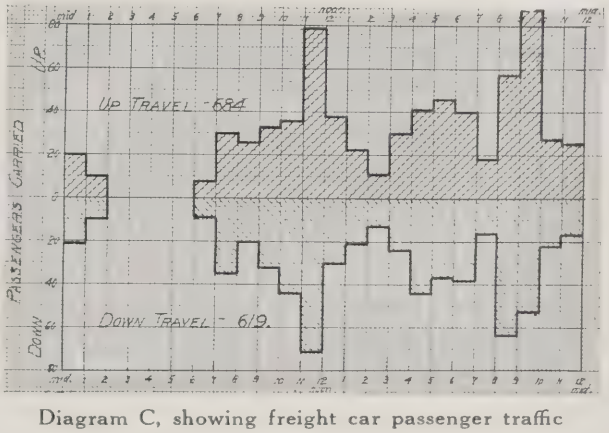


Diagram C, showing freight car passenger traffic

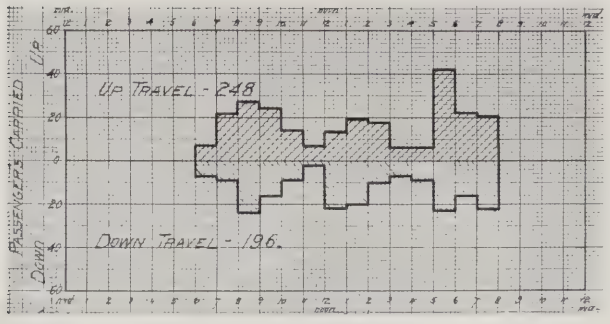


Diagram D, showing service car passenger traffic

of estimation, aided, perhaps, by test results. It is not so much a question of relative elevator efficiencies, that is, pounds of steam on the one hand compared to kilowatt hours on the other, values which could be determined with comparative ease, as of the effect that the type of elevators in use may have on the operating methods and costs of the engine and boiler rooms. An elevator study therefore almost necessarily becomes one embracing the entire subject of light, heat and power production.

Take, for instance, a hotel having hydraulic elevators, an electric generating plant, a steam refrigerating machine, steam pumps, a kitchen, and a laundry. Remember also that the building must be heated, that it uses large quantities of hot water, and that a certain amount of the steam required for these purposes can be obtained from the steam exhausted from the piston apparatus. Consider a fireman employed in firing the boilers. The coal that he handles will produce a certain amount of steam. Part of that steam will be used by the elevator pumps; after doing its duty there, it may flow into the radiators to help heat the building, or it may issue from the exhaust head into the atmosphere. This will depend on the amount of steam required for building heating at the time, and the total amount available from all of the piston apparatus. The problem to be solved, then, is what proportion of the coal is chargeable to the operation of the elevators, and what to the other apparatus.

Again, what proportion of the fireman's time may properly be charged to elevator operation? Theoretically this could readily be calculated, but for all practical purposes it is rather useless to ascertain that one-tenth, or one-sixth, or one-half of the fireman's time is thus chargeable, unless at the same time it is possible to eliminate the fraction thus determined from the payroll. For instance, if there is but one fireman to a shift, we cannot readily dispense with one-tenth of him, and the payroll is not affected unless, indeed, methods can be so adjusted that one shift can be eliminated. If, on the other hand, there are a number of firemen, it is possible to dispense with fractions of the total, and theory and practice may meet on common ground.

In reviewing the general considerations involved in elevator electrification, it may be well to separate the buildings equipped with hydraulic machines into three broad general groups or classifications:

A. Where the existing hydraulic equipment is outworn, and must be replaced.
B. Where the existing hydraulic equipment still has some years of useful life remaining, but where an improvement in the service is desired.
C. Where the existing hydraulic equipment still has some years of useful life remaining, and is giving adequate and satisfactory service.

There is little or nothing to be said about Class A in this article. It is assumed that new elevators must be installed, and presumably they will be electric. The details of kind, speed, capacity, etc., are all matters that must be determined from a knowledge of local conditions and requirements. In Class B, the question of business judgment enters largely into the determination of whether or not to electrify. While it is almost safe to assume that economies will be effected in the operating costs by installing new electric elevators, it does not necessarily follow that these economies will be sufficient to cover the fixed charges of interest and depreciation on the investment required for the new cars. If they do not, the property owner, realizing that his service is not satisfactory, must then decide whether or not the improvement to be expected, with its attendant advantages as reflected in the rent roll, will be sufficiently great to justify the investment.

Classification C presents some very nice problems, the solution of which calls for an intimate knowledge of the practical side of engine and boiler room operation. The assumption is that the property owner will be content to continue the operation of his building equipment along the existing lines unless he can see that after allowing for interest and depreciation on the required investment there will be an annual saving by electrifying it. It has been pointed out that hydraulic elevator operation is closely tied in with other building services. Large buildings erected when hydraulic elevators were in vogue were usually provided with electric generating plants as well as extensive equipment of steam pumps and other apparatus, the presence of which complicates the solution of the elevator problem, which thus extends itself to include the entire power plant, for if the elevators are electrified, the generating plant will in all probability be inadequate to carry the increased load, and some provision must be made for motive power. Four methods of treatment then suggest themselves:

1. The generating plant may be enlarged sufficiently to carry the elevator load.
2. The plant may be continued as it is, and the elevator load placed on station service.
3. The generating plant may be shut down and the entire electrical load placed on central station service.
4. The generating plant may be shut down, the other steam equipment electrified, and the entire electrical load placed on central service.

Plan 1 is open to the disadvantage that it involves an extra expenditure which materially increases the total investment required, with the added drawback that it tends to perpetuate a system which many believe is sooner or later to be superseded by central station service, a view which present tendencies encourage. Plan 2 presents the attractive feature of requiring no investment for machinery, but it possesses the great disadvantage of involving the use of two separate sources of power, the limited requirements of each making it impossible to obtain the maximum economy from either. As a rule, central station rates for electrical energy depend partly on the amount of current used and partly on the nature of the load factor. It will be apparent that the rate obtained for the supply of elevators only will be materially higher than for the entire electrical requirements of the building, while on the other hand a private plant operated for only a portion of the building's service will necessarily be handicapped. Plan 3 is subject to the same objections as Plan 2, although to a less degree. It contemplates the placing of the entire electrical load on central station service but retaining in operation whatever steam apparatus there may be, such as pumps, compressors, etc. Equipment of this kind is very wasteful of steam, and necessitating the operation of high pressure boilers, permits the plan to make comparatively little change in the engine and boiler room attendance, with a resulting lack of economy.

For some years the tendency has been in the direction of Plan 4. Since the war the price of practically everything that enters into the cost of plant operation has shown a very large increase, while as a rule the central station rates for electricity have received little modification. As a matter of experience, it has been found in the general run of such cases that the true point of economy can only be reached by establishing harmony in the operating conditions. That is, if the elevators are to be electrified, it will probably be advisable, if there is other steam equipment present, to electrify it also, either taking current from the central station, with the steam system on a low pressure basis, or supplying the electrified load from the local generators. As it is quite possible in such circumstances to estimate operating costs with considerable accuracy, an important point in view of the large investments involved, the best course to follow in each individual case can with a reasonable exercise of care and judgment be ascertained.

While it has been the usual custom in high grade buildings where elevator changes are made to substitute for the hydraulic equipment complete electric machines, it has occasionally been found of advantage, instead, to leave the hydraulic apparatus intact, merely replacing the steam pumps by electrically-driven units. It may be said at once that this type of electrification is far less efficient from a current-consuming standpoint than the more complete change, but that on the other hand the cost of making the change is very much less, and if the fixed charges of interest and depreciation on the investment are considered, as they of course should be, the advantage in total operating costs may lie with the less efficient but cheaper equipment. The matter is one which involves careful calculations.

The exact condition of the hydraulic machinery will naturally in many cases determine the type of electrification, for it will be apparent that it would be unwise to undertake the expense of providing new electric pumping units for the operation of apparatus which would, in any event, require replacement in a comparatively short time. It would be better in such a case to anticipate the inevitable and make the complete elevator change-over at once. Assuming the elevator equipment to be in good shape, however, and that the question of whether to electrify completely or by the use of electric pumps is to depend on the question of operating expenses, it will be found that the main item of difference in the two methods pertains to the consumption of current and the fixed charges on the investments.

The other items of cost that need be considered in a study of this kind, and some idea of the relative values involved, may be gathered from the summary here given of the estimates prepared in connection with a large modern multi-story office building, having nine hydraulic elevators, a generating plant, and a full complement of steam pumps.

ESTIMATE 1

Operating Costs for Light, Heat and Power with Hydraulic Elevators and Steam Plant

Coal, 6,840 Tons	$54,720
Labor—1 chief engineer 1 asst. " 3 watch engineers 3 oilers 4 firemen 3 coal passers 1 handy-man 16 men	28,340
Ash Removal	2,740
Boiler Feed Water	1,200
Supplies and Repairs	5,000
Total Operating Cost	$92,000
Interest and depreciation on salvage value of plant plus value of space occupied	3,000
Total Cost	$95,000

ESTIMATE 2

Operating Costs for Light, Heat and Power with Electric Elevators, Electric Auxiliaries and Central Station Service

Coal, 2,340 Tons	$18,720
Labor—1 chief engineer 3 watch engineers 1 handy-man 3 firemen (for 30 weeks)	10,780
Ash Removal	940
Boiler Feed Water	160
Supplies and Repairs	1,400
Electric Service	26,500
Total Operating Cost	$58,500
Interest and depreciation on necessary investment	21,500
Total Cost	$80,000

ESTIMATE 3

Operating Costs for Light, Heat and Power with Hydraulic Elevators Electrically Operated, Electric Auxiliaries, and Central Station Service

Coal, 2,340 tons	$18,720
Labor (as given above)	10,780
Ash Removal	940
Boiler Feed Water	160
Supplies and Repairs	1,400
Edison Service	39,000
Total Operating Cost	$71,000
Interest and depreciation on necessary investment	6,000
Total Cost	$77,000

It is seen that in the case of this building the increased use of current with the electro-hydraulic equipment very closely balances the larger fixed charges on the greater investment required for straight electric elevators, and that the question of the length of useful life remaining in the hydraulic apparatus becomes the determining factor.

In another building, a large apartment house having 14 hydraulic elevators, all in good condition and giving satisfactory service, operating cost calculations which were recently made led to a recommendation for the installation of electric pumps for the elevators. The estimates prepared in this case may also prove interesting.

ESTIMATE 1

Operating Costs for Light, Heat and Power with Hydraulic Elevators and Steam Plant

Coal, 7,800 Net Tons	$46,800
Labor	26,615
Ash Removal	2,949
Oil, Supplies and Repairs (average per year)	5,000
Water (to boiler plant)	1,095
Total Operating Cost	$82,459

ESTIMATE 2

Operating Costs for Light, Heat and Power with Electric Elevators, Electric Auxiliaries and Central Station Service

Coal, 3,000 Net Tons	$18,000
Labor	11,696
Ash Removal	1,200
Oil, Supplies and Repairs	1,000
Water (to boiler plant)	300
Purchased Electricity	30,430
Total Operating Cost	$62,626
Interest and depreciation on investment	21,000
Total Cost	$83,626

ESTIMATE 3

Operating Costs for Light, Heat and Power with Hydraulic Elevators Electrically Operated, Electric Auxiliaries and Central Station Service

Coal, 3,000 Net Tons	$18,000
Ash Removal	1,200
Labor—3 engineers, 1 fireman, 2 firemen (30 weeks), 1 relief man	11,696
Oil, Supplies and Repairs	1,500
Water (to boiler plant)	300
Purchased Electricity	35,155
Total Operating Cost	$67,851
Interest and depreciation on investment	8,400
Total Cost	$76,251

In estimating the consumption of current by electric elevators, it is usual to calculate it from the annual car mileage and the assumed kilowatt hours per mile. The former can be determined by placing counters on the apparatus to indicate the number of trips which, when multiplied by the travel per trip, will give the required result. In the absence of counters the same information may be obtained through the co-operation of the elevator operators.

The consumption of current per car mile is not so readily ascertainable. In the case of straight electric elevators it varies according to the speed and carrying capacity of the cars, the number of stops, and the care exercised in operation. For electro-hydraulic equipment there is less variation, a hydraulic elevator requiring the same amount of water with the car empty that it does with the car loaded. The accompanying test results of several high grade elevator installations in New York may be of interest in this connection.

10-story Office Building (Electro-Hydraulic Elev.)
Volume 1,757,000 cu. ft. Area of Plot 11,000 sq. ft.

Period of Test	Car Miles	Kw. Hrs.	Kw. Hrs. per C.M.
Elev. 1			
" 2			
" 3			
" 4			
56 days	2,623.6	26,832	10,227

17-story Hotel (Electro-Hydraulic Elevs.)
Volume 2,615,000 cu. ft. Area of Plot 12,500 sq. ft.

Period of Test	Car Miles	Kw. Hrs.	Kw. Hrs. per C.M.
Elev. 1			
" 2			
" 3			
" 4			
30 days	2,456.5	23,600	9.64

The variation shown in the consumption of electrical energy per car mile by the straight electric machines, much of which results from a difference in the operation requirements, calls attention to the importance of carefully studying these requirements before attempting to estimate on the use of current. The consumption of the electro-hydraulic equipments, it will be seen, is about twice or four times as great per car mile as for straight electric machines. Notwithstanding this large difference, the cost of the change-over work is so much less that it may be expected that many more installations of this kind will be made. In fact, decision has recently been reached to electrify the entire equipment of 23 elevators in one of New York's most prominent department stores, in the expectation that before the hydraulic apparatus is entirely outworn, sufficient saving will have been put aside to install new electric machines of the most modern type.

The question of elevator service in a building of many kinds is so important that upon its solution may well depend the entire matter of its being a success or a failure. When it is remembered that many buildings in large cities represent investments which run into large figures, it will be readily seen that the elevator problem is a matter upon which often hinge large financial interests.

ITALIAN RENAISSANCE DETAILS

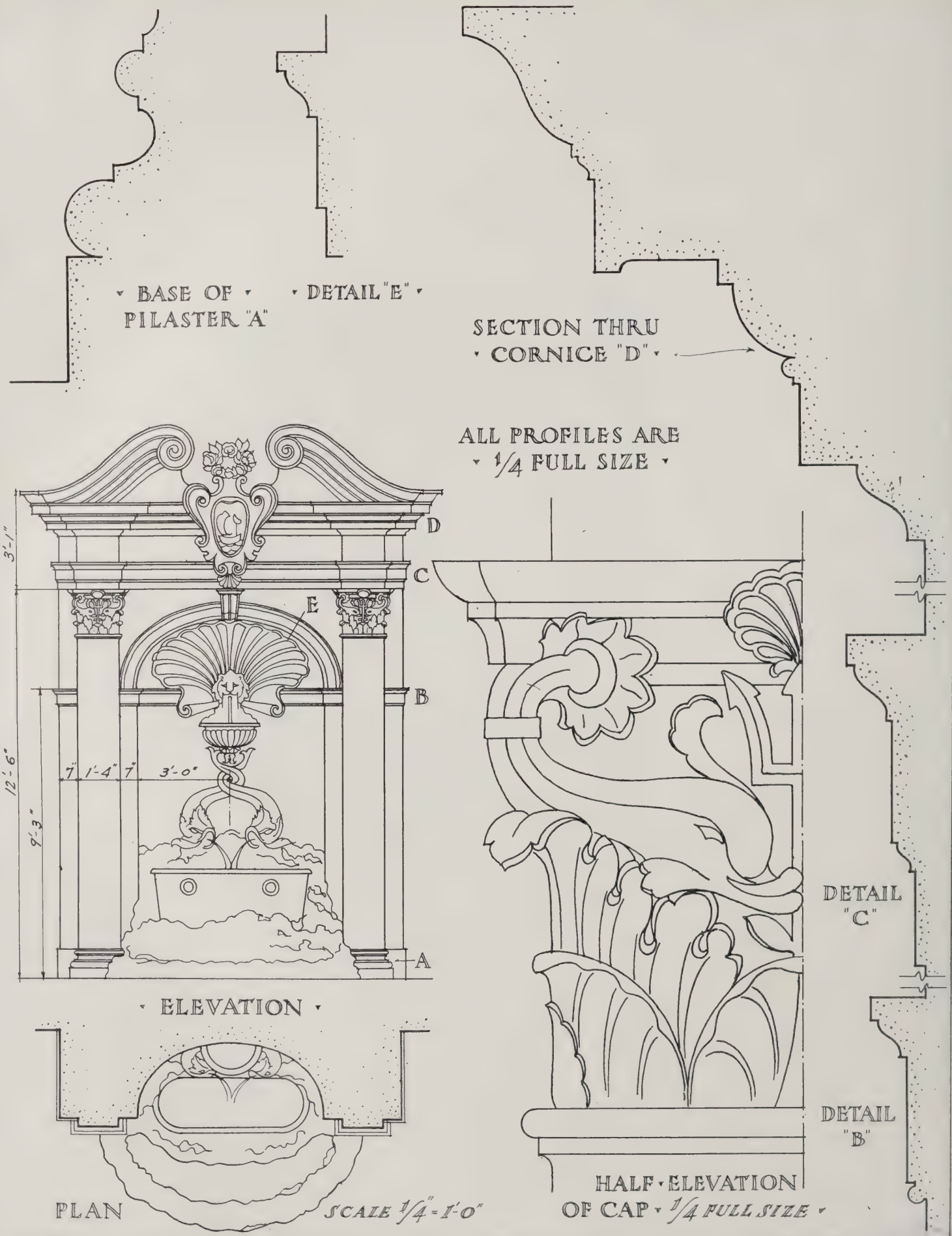
A SERIES OF MEASURED DRAWINGS

By HUNTER McDONNELL

WALL FOUNTAIN IN COURTYARD ON VIA GIULIA, ROME

THE wall fountain, so often found in Italy, is quite as useful in America. In Italy it adorns courtyards, cortiles and loggias, and it often finds its happiest uses in gardens. In America it may be found in all these surroundings, and frequently in conservatories or even in hallways and other parts of houses.

The fountain, which stands in the cortile of a small house in Rome, is so placed that it forms an effective termination to the vista down a passage which leads from the street. It is cut from the finest and hardest travertine, and its detail, unlike the detail of so much work of the baroque period, is minutely and clearly carved. From the center of the elaborately carved shell which fits the head of the niche, a stream of water issues from the lion's head into the upper bowl. Two dolphins play streams of water into the large basin which is of some depth and probably served as a water trough for domestic use. This large basin or trough is supported on a bed of rough, spongy cement work covered with moss to give the effect of natural rock.

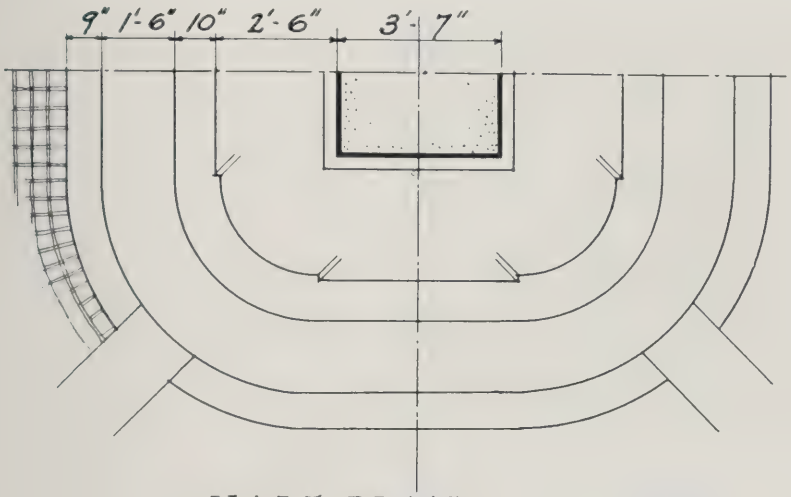


ITALIAN RENAISSANCE DETAILS

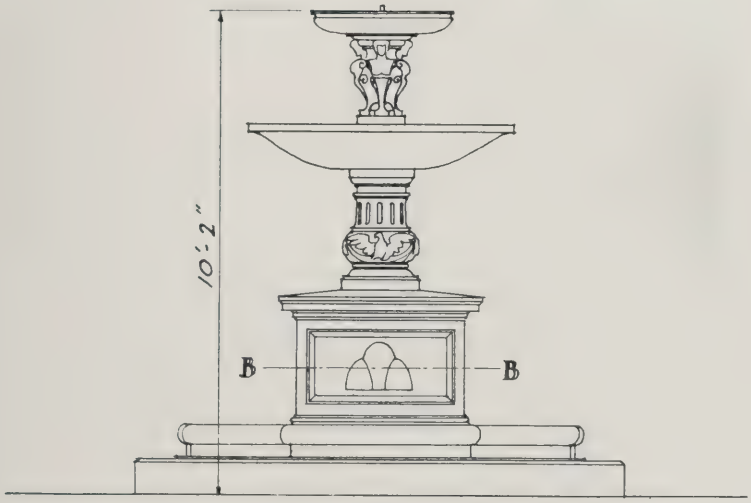
WALL FOVNTAIN IN COVRT-YARD ON VIA GIVLIA ROME

MEASVRED & DRAWN BY HVNTER McDONNELL

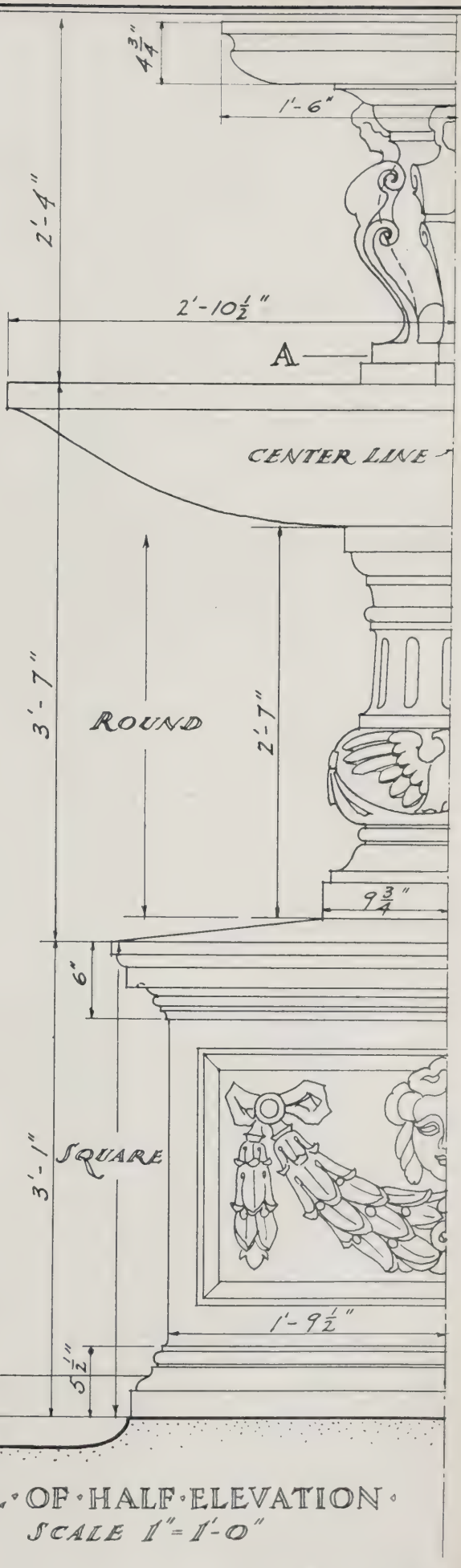
PLAN AT "A" (LOOKING UP)



HALF PLAN ON LINE "BB"
SCALE 1/4"=1'-0"



ELEVATION
SCALE 1/4"=1'-0"



DETAIL OF HALF ELEVATION
SCALE 1"=1'-0"

ITALIAN RENAISSANCE DETAILS	FOVNTAIN IN COVRTYARD OF MONTE DI PIETA ROME	MEASVRED & DRAWN BY HVNTER McDONNELL

ITALIAN RENAISSANCE DETAILS

A SERIES OF MEASURED DRAWINGS

By HUNTER McDONNELL

FOUNTAIN IN COURTYARD OF MONTE DI PIETA, ROME

THIS fine example of a free-standing fountain forms an integral part of the design of the stone-paved court in which it stands and is proportioned to the architectural treatment about it. The fountain is made of the travertine so extensively used in Rome, and has taken on a mellow gray tone with age. The carving in the rectangular panels of the base is boldly executed in high relief; that of the baluster supporting the bowl is lower, blending into the contour of the turned form.

The small upper basin is supported on the heads of three caryatid figures which are deeply undercut, leaving a thin stone core through which the water pipe passes to the top. The upper basin is covered with a lead pan, into which the water falls from a spout at the center. The overflow spills into the large bowl and then flows over the shallow stones built into the pavement.

European Town Squares

PART II

By GEORGES BENOIT-LEVY

WITH Paris establishing the standard for the entire country, it follows that every provincial city in France is a more or less faithful copy of Paris, though the traveler, whether architect or layman, whose powers of observation are keen will note in many a city or town old buildings of certain architectural types which are survivals of past ages and show the use of some particular local style or some peculiarity of design.

Nancy

The *Place Stanislas*, the *Place du Gouvernement*, and the *Place de la Carriere* are among the finest squares in this interesting old town. They succeed each other and merit this compliment of M. Maurice Barres, who refers to them as "These three famous squares which the city, wrapped up as it is in business, preserves like *salons* to receive and dazzle strangers." The *Place Stanislas* is surrounded in large part by public buildings: *Hotel de Ville* (former palace of the dukes of Lorraine), Prefecture, Theater, Hotel. Its sober facades are relieved by the lamp standards and grilles of wrought iron, by the delicate statuary, and by the nearness of the public garden, whose foliage we see emerging at one of the corners in one of these illustrations. The *Place Stanislas* and those which succeed it in the scheme are of the best types of the administrative center.

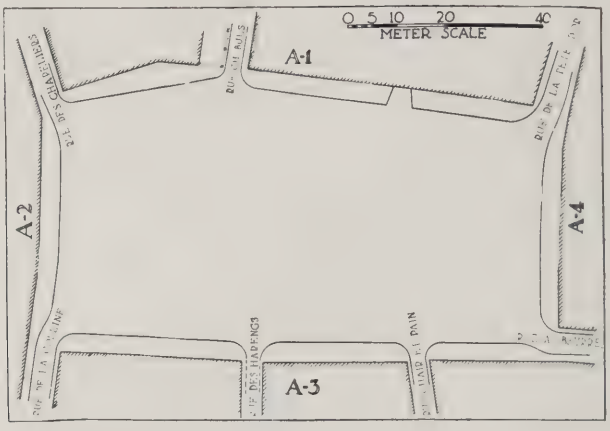
Brussels

Belgium is Brussels, and Brussels is the *Grand Place*.* There is no nation in the world which has developed love of country and civic spirit as we find them in Belgium, and nowhere are these qualities given better material expression than in the public squares. This *Grand Place* of Brussels is truly the heart of the city. It centers all the activities of Brussels about its *parvis* of 100 by 50 meters. At the west, the *Hotel de Ville*, of a flamboyant Gothic style, is one of the largest and richest in the Low Countries. The right portion dates from 1402, and the left wing was built in 1444. The tower (98 meters) was finished in 1454 and is surmounted by a statue of St. Michael, the patron of the city. The rear facade, in the style of Louis XIV, is of 1706. The *Maison du Roi,* formerly *Broodhuis* (Bread Hall), 1873-1896, replaces a building of the same style of the end of the fifteenth century which formerly served as a dwelling for the functionaries of the court. On the second floor it contains the communal museum. At the side of the *Maison du Roi* is the house of Victor Hugo, with a bust of the poet over the entrance portal. At the south, that marvel of the renaissance, the *Palais des Ducs*; at the south-

*The figures below illustrations will be found to identify locations of buildings on the different plans given in these pages.

Place de la Carriere, Nancy, France
Palace of the Government at the rear. Opposite in Place Stanislas is the City Hall

Hotel de Ville, Grand Place, Brussels (A-1)



Courtesy, City of Brussels

The Grand Place, Brussels

west, the *Maison des Brasseurs* (Brewers) at the north, the house of the guilds; houses of the silk merchants, boatmen, archers, carpenters, coopers and bakers, each with the symbol of its saint or its patron rising above its gable. And what local names, and how typical are those of the streets climbing up to this square, the *salon* of the city, with its rich facades often enlivened by the colors of the flower market where the pretty flower girls sit!

La Maison des Ducs, Grand Place, Brussels (A-2)

Streets of the Hill, of Herrings, of Meat and Bread, of the Golden Head, of the Hatters, of Butter, how many generations have trod your heavy pavements, your narrow sidewalks, some of which are only a meter wide, and the widest of which do not reach two meters and a half!

Liege

Liege, with its 170,000 inhabitants, is one of the glories of the Belgian provinces. The administrative, religious, and university centers occupy the district between the Meuse and the northwest confines of the *Boulevard de Ceinture* which surrounds the city. Beyond it various suburbs are springing up.

Especially admirable are the *Palais du Gouvernement* and the *Palais de Justice,* fraternally united in the building surrounded by the squares of St. Lambert, Notger, Foch, and du Marche. This building, covering four and one *hectaires* (about 10 acres), is of interest to us on account of its two interior courts, the first of which measures 600 by 400 meters, and the second 400 by 300 meters. The first, which we enter by the gateway, is surrounded by a gallery of low, pointed Gothic arcades resting on 60 columns whose capitals are decorated with capricious masks, garlands, and other varied ornament. It communicates with the second court, which is of a quite different character, by a passage fashioned at the extreme corner of the gallery opening at the right of the portal. This court has arcades on only two sides, and those of the north are partly walled up. In the center there is a circular basin surrounded by plants and shrubs. All is calm and tranquil in this little-frequented court which incites one to revery. A gate at the rear leads to the *Rue du Palais.* These courts consti-

tute two examples which are still offered to the architect or the constructor of cities desirous of arranging intimate squares about which public buildings may be grouped. Commenced in the tenth century, completed, destroyed, reconstructed, the most recent scheme of the building is that affected by the provincial government, and due to Delsaux, in 1550. Its facade is in the pointed style, and it is a good example.

La Maison du Roi, Grand Place, Brussels (A-3)

Bruges

Bruges, sung by the poets, is celebrated for its quays, its *beguinages* (convents), and its squares. Let us glance at the *Place du Bourg.* We find it surrounded by these buildings: the *Hotel de Ville,* built during the reign of Count Louis de Mach in 1376, on the site of the *Maison des Echevins,* with its facade adorned by 50 statues representing the worthies of the Old and New Testaments; the old *Greffe,* contiguous to the *Hotel de Ville,* constructed from 1535 to 1537 in the style of the renaissance, its graceful gable ornamented with bas-reliefs and statues in gilt bronze,—this is the seat of the justice of the peace and of the council of war; the *Palais de Justice,* built in 1722, on the site of the palace of the counts of Flanders, called *Palais de France.*

Let us now see the *Grand Place.* It measures respectively on each of its axes 60 to 80 meters. Its irregular form adds to its charm and almost hides the openings of the streets which have access to it; *Rue aux Lainages* (Woolen Goods), *Rue de la Halle, Rue des Pierres, St. Amand, Marche aux Œufs, Rue de la Crevette* (Shrimp), all picturesque and expressive names. This square is surrounded by commercial houses and administrative buildings, of which the principal ones are these: the *Halles,* surmounted by the Belfry, built on the bed of the ancient *Boserbeck,* dating from about the year 1248, and remodeled from 1561 to 1566. The tower of the *Halles,* which is 85 meters high, contains in its second story the "bell of triumph," weighing 19,000 pounds. Eight men hardly suffice to set it in motion. The upper stage of the tower encloses chimes of 49 bells, weighing in all 56,166 pounds. The *Hotel du Gouvernement* and the post office on the site of the old *Watehralle,* constructed in the local style of the sixteenth century. On the second floor of the post office are the archives of the city of Bruges, with documents dating from 1281. The age of these towns must be remembered.

Mons, St. Nicolas, Furnes

Mons, an industrial and art city of the Borinage, is, like every other Belgian town, proud of its grand place with its *Hotel de Ville,* its *Palais de Justice,* its *Palais des Beaux Arts.* Its belfry is 57 meters high, rich with a chime of 47 bells.

St. Nicolas (35,000 inhabitants) has a *grand place* of about eight acres. Everything is in harmony with this *grand place,* for each house has its garden and each quarter its parks. Patrick Geddes has called it the ideal garden city.

Furnes (5,500 inhabitants) has a history which goes back to the beginning of the Christian era. On

Les Maisons des Corporations, Grand Place, Brussels (A-4)

East Side, Place Pharailde, Ghent (B-1)

the spot occupied by the church of St. Walbruge there arose a temple dedicated to the god, Wotan. The *Grand Place* is all the more curious in that it is admirably framed by a series of public buildings which extend to the other enclosed little square.

Ghent

A really marvelous old town, in which the spirit of the past lives on. Filled as Ghent is with treasures, the marvel of marvels of all squares is the *Place Sainte Pharailde* of Ghent,—Ghent of which Charles V said: "I would put Paris in my Glove (Gand). Gand, the French name for Ghent, is the same as the word for glove (gant). On this rectangular square of 37 by 55 meters, entirely enclosed by old buildings, is held one of the large vegetable markets of the city. The monumental gateway of the fish market is on one of the corners.

The square is well enclosed. The streets which end there do not make any gap in the series of facades which border it. They open in the corners of the square, and even when one is on a line with one of these arteries, the view is limited by its windings. The heavy traffic is on the north and east sides. A short distance is the *Haute Rue du Soleil* (High Road of the Sun)—what a magnificent name! To the northwest there is a large bridge over the canal of the Lieve, and also in the *Rue Petit Marche aux Poissons* there is a large bridge over the river La Lys. A short way from the square, the *Rue Quai de la Grue* (Quay of the Crane) arrives at the Lys, which it then continues to border.

Here we have the arrangement of the sides of the square itself; first the north side, occupied

Castle of the Counts of Flanders, North Side, Place Pharailde, Ghent (B-2)

Plan, Place Pharailde, Ghent

Photos and Plans, Courtesy City of Ghent

South Side, Place Pharailde, Ghent (B-3)

entirely by the enclosing wall and the entrance *Chatelet* of the castle of the counts of Flanders, of a dark gray Tournai stone and a yellowish gray sandstone. Second, on the east side, houses of red brick and white stone. Third, on the south side, sixteenth century houses and the monumental gateway of the *Marche aux Poissons* of red brick and white stone and facades entirely of stone. Fourth, west side, houses of the sixteenth and seventeenth centuries, of the same type of construction.

I cannot enough thank the municipal administration of Ghent, which was so kind as to mark on the plan the date of construction of each building, all shops or inns of the purest Flemish style and forming a striking contrast with the chateau to the north. An enclosed square of moderate dimensions, adapted for an active market, bordered on two sides by a river, one can imagine the magic aspect of this unique monument of civic art. The actual point from which each of the illustrations was made will be found indicated upon the plan.

Certainly one couldn't apply that anathema hurled forth by Walt Whitman to all these squares: "There is nothing but thoughtlessness and reckless-

Sixteenth and Seventeenth Century Houses, West Side, Place Pharailde, Ghent (B-4)

Post Office and Governor's Palace, Bruges (C-1)

Courtesy, City of Bruges

Plan of Grand Place, Bruges

ness in the matter: the helplessness of people who don't live long enough to do a thing themselves, and have not manliness and foresight enough to begin the work and pass it on to those that shall come after them." No! To these we would apply rather the thoughts of M. le Baron de Montenach: "Formerly, towns were made, according to the quaint expression of an ancient chronicler, for the happiness of their inhabitants. The old towns were not perfect, but they were social." And how justly Mr. MacDonald saw things when he wrote me: "Our ancestors were masters in the art of grouping of buildings, obtaining development so that it does not have the air of an institution, which is so likely to be the case when towns are planned in a wholesale manner, as so often happens. In things of the past, it is reasonable to seek to learn from the formation of cities of other days.

My thanks are due to *Le Syndicat d'initiative de Paris,* which is a real welcome league for Americans visiting Paris; to M. Francois, Chief Surveyor of Paris; to *Les Amis de Paris,* the president, M. Edmond Benoit-Levy, to his actual secretary, M. Maillard, noted historian of Paris; to M. Edmond Maurice Levy, curator of the *Arts et Metiers Library.* I must also acknowledge the co-operation of the *Syndicat d'initiative of Rouen, Les Amis de Strasbourg,* Mr. Georges Dubose of Rouen, the Information Official Bureau of Brussels, and more than of anyone else, of M. Libouton, director of the Belgian State Railroads.

Most grateful thanks are due to his Excellency, Governor Gregoire of the Liege province, to the mayors and city engineers of Rouen, Strasbourg, Brussels, Liege, Bruges, Mons, St. Nicolas, Furnes and Gand.

GEORGES BENOIT-LEVY.

Hotel de Ville and Palace of Justice, Place du Bourg, Bruges

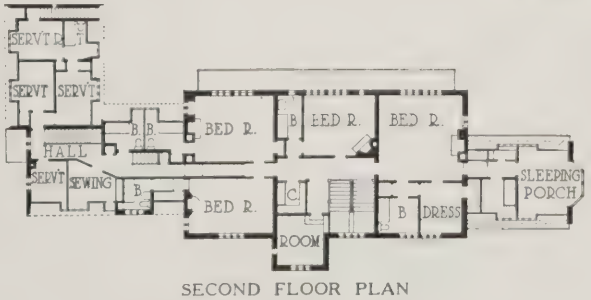
GARDEN FRONT

HOUSE OF HARRY C. BLACK, ESQ., GUILFORD, BALTIMORE

LAURENCE HALL FOWLER, ARCHITECT

DETAIL OF PORCH AND GABLE END

FIRST FLOOR PLAN



SECOND FLOOR PLAN

HOUSE OF HARRY C. BLACK, ESQ., GUILFORD, BALTIMORE

LAURENCE HALL FOWLER, ARCHITECT

DETAIL OF GARDEN FRONT

DETAIL OF ENTRANCE PORCH

HOUSE OF HARRY C. BLACK, ESQ., GUILFORD, BALTIMORE

LAURENCE HALL FOWLER, ARCHITECT

TWO VIEWS OF DINING ROOM
HOUSE OF HARRY C. BLACK, ESQ., GUILFORD, BALTIMORE
LAURENCE HALL FOWLER, ARCHITECT

HALL AND STAIRCASE

LIBRARY MANTEL

HOUSE OF HARRY C. BLACK, ESQ., GUILFORD, BALTIMORE

LAURENCE HALL FOWLER, ARCHITECT

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Publicity for the Architect

By HOWELL TAYLOR

AN intelligent plan for publicity, systematically carried out, will stabilize professional architectural practice and insure future commissions if the field of activity has been carefully analyzed and the publicity matter properly presented. "Nothing that insures future improvement can be safely overlooked. Especially when business is good should steps be taken to keep it so. Back of it all is selling. Selling means telling. Advertising is telling. The advertising of yesterday and the day before helps make business good today. Today's advertising insures tomorrow's prosperity."

The publicity man who wrote this paragraph not only knew his own business but he suggested a point of view which has established the motivating force for success in many important commercial efforts.

Professional men have been brought up to decry the use of advertising, although they have accepted the desirability of publicity, whereas if we define publicity as any agency intended to keep the name and activity of a firm before the field of prospective clients, and realize that "back of every sale, whether the item be overcoat, automobile, or architectural service, the customer's mind must be brought to the buying point," it is evident that some form of advertising must be used in order to continue in practice. In some way the client's attention must be called to the professional service offered, and he must be convinced that he will benefit by it. However this be done, whether by published statements in magazines, by letters, by personal salesmen, or by chance word of mouth, it is all advertising, and the manufacturer or professional man who says he does not believe in advertising has not analyzed the basic principles of selling. He would not be selling his product if he did not advertise. Every bona fide, successful sale of any article or service must be preceded by advertising. It may not be specifically directed at a particular product, but it is always present. Advertising is only the education of prospective buyers, and the sooner architects begin using some systematic plan for educating their clients the less clamor will be heard concerning the instability of professional practice. Systematic publicity is business insurance; how it is produced matters little. Certain forms of publicity are more desirable for one business than for another, but publicity must be created if a steady flow of contracts is to continue. Working out a definite program for publicity has not become common among architects, however, and they have followed the hit-or-miss method of merely accepting the commissions which come to them without making any definite or systematic effort to encourage the receiving of commissions. This has always been due to the aversion of architects to anything which might suggest the "unprofessional." Now, however, a much broader view is being accepted by architects, for success in any line of effort today is based upon clear thinking and logical reasoning, and the professional man who deals with commercial elements is now realizing that the legitimate principles of business apply also to his activities.

Modern industry never attempts to sell its products without some definite advertising and selling plan which has been carefully conceived and is consistently developed. Business men are accustomed to and expect a straightforward presentation of facts in entering upon any project, and modern salesmanship has so standardized the businesslike presentation of commodities that deviation from accepted methods is looked upon askance.

It has been a matter of general public belief that architects are poor business men. In the profession itself it is conceded that the successful firm must be made up of at least two distinct types of men—the business-getter and the dreamer. This idea must be changed, however, if architects expect to compete with engineering corporations and other agencies which are rapidly usurping the architect's place. To compete with the modern engineer, to be able to talk to the business man intelligently—and it must be realized that the great bulk of the dealings of architects are with the business and not with the artistic world—architects must assume the rôle of commercial scientists, however distasteful it may be to many of them, and must talk to the layman in language which he understands if they expect to win his confidence. Architecture needs a salesman. It needs to be "sold" to the public on a basis of "profit to you." The man in the street must be convinced that architects can give him real service. It must be proved to him that the carefully trained architect is not an expensive luxury.

Through analytical thinking in the business world, there has come the demand for a building service which simulates the efficiently conducted processes of modern industry, and one of the most serious

problems which now confronts the architect, namely, that of competition with the engineering corporations, has been caused by the members of the profession refusing to accept fully the responsibility of the business aspects of building.

The public—the business man, the average potential client—is in the habit of accepting things as they are done in the commercial way. He is giving little or no thought to what does or does not exist as a custom or practice in the professions. He wants a building. He has seen the names and advertised abilities of numerous contracting or engineering corporations. Finally news of his desire spreads, and he is called upon personally by trained salesmen who can give him real cost figures and who are openly competing with each other for the job. Unless this potential client has happened to have some special connection with architects and knows the quality and kind of service able architects are equipped to render, he accepts readily enough the practical offer of their competitors. It is safe to say that this incident happens daily many times in a score of cities. Engineering and contracting corporations are simply meeting an average problem of merchandising in the usual commercial way, and their customers expect it. As a result, architects lose business because they do not meet this competition.

Incidentally let it be understood that this is not a plea for getting the architect involved in extensive advertising campaigns intended to promote the growth of his practice, nor is it a suggestion that he make use of "billboard broadsides" or "double-page spreads" in the magazines and newspapers or any activity approaching such a lapse from professional dignity, but it is an attempt to urge a much freer and more systematic use of the subtle avenues of publicity as a fixed policy.

Barring great underlying causes for economic change, such as we have seen during the world war, there is no reason why the demand for an architect's service cannot be stabilized and be made to show a normal increase from year to year just as with any other business, but it is no more logical for an architect to go about presenting his case to prospective or potential clients without a carefully developed plan of publicity than it would be to lay out an extensive building project for a growing institution and provide for no future expansion. There must be a plan of action which can only be determined by a careful study of the field in which it is desired to work. No sporadic bursts of advertising activity ever arrive anywhere; they are costly and seldom mean anything to the user other than a firm disbelief in all advertising. To be useful and successful, a careful program of publicity must be drawn up after a thorough survey of the field in which activity is practicable.

Architecture is not a business, but it is so indissolubly linked with business in all its phases that its problem cannot be considered professional in the light that lawyers and doctors consider theirs as professional. The professional problems of the architect are economic and commercial and must be recognized as such. The attempt to keep the "cloak of professionalism" tightly drawn about his shoulders has shut out the architect from the place in the community which he should be occupying. The fact that so small a percentage of the total volume of building is designed and built by architects is significant proof of this fact.

In selling his service to the client, the successful architect must study the client's point of view. He must anticipate a client's demands and be able to present convincing proof of the value of architectural service. Let us examine the mental process of an average prospective client. We may safely assume that he is a business man. His impulse to build is set in motion by commercial needs or the desire to improve some condition. He asks himself what kind of building he wants. He thinks in terms of what he has seen, of what he is reading, and of what his associates tell him. He reads two or three trade magazines relative to his business, one or two class magazines and perhaps one general magazine; he will glance through a striking monograph sent to him through the mail; personal letters addressed to him will usually receive answers, and he will generally accept personal calls relating to anything in which he is really interested.

The details of large building operations come into the experience of the average prospect but seldom—once or twice in a lifetime perhaps. When his building problem does present itself, the degree of its importance is considerably exaggerated. He has always supposed that he knew a lot about so simple a thing as building, but he finds he is confronted by something very complex. He knows in a general sort of way that architects plan buildings. He has heard that some are good and others bad. He knows that there are building corporations which keep within cost estimates and take complete charge of details. He discovers that he must investigate the situation very carefully, but finds that he first wants to know what has been done in the field which interests him. Here then is offered an excellent point of contact for the architect, and it is up to him to make the most of it. The client's attention can be gained not by explaining what good architects they are, but by presenting very graphic descriptions of buildings which interest him in media that he cannot help but see, making careful mention of certain important solutions and the architect's connection with them.

Were the public generally "sold" on the idea of hiring an architect for its building operations, as it is on the idea of engaging a lawyer to fight its legal battles, perhaps no concessions to the modern business point of view would be necessary on the part of the architect; but it is not, and the problem resolves itself then into one of expediency. It is not a question of "Shall we advertise?" but "How shall

we advertise?" How shall we educate our potential clients to the point of buying our services?—for when a definite point of contact is determined, it becomes a simple matter to present the worthwhile facts concerning an architectural office which will prove to the client the reasons why he should select this or that practitioner.

Some means must be found of catching a client's interest, but no statements concerning the quality of any architect's service will do this unless he has actually arrived at a point where he is ready to select his architect. More often than not the process of his education regarding the building he wants has been so closely associated with his observations about architects that his mind (on selection) is made up before he realizes it. Often, however, the old story about the early bird holds good; in other words, the architect who goes after the business in terms that a client expects to hear, commenting here and there on the way his office would handle certain problems, will find that he is selling his services.

A client's first impulse, when his building problem presents itself, is to set in motion some sort of investigation which will give him a fairly complete idea of what has been done in the field where his interest lies and what is the general trend in similar buildings under construction. The alert architect must sense this impulse and be prepared to meet it in a way that the client understands. For example, glance through the advertising pages of any newspaper or magazine and you will find that except in the case of well-established houses which are now doing "institutional" advertising, every commodity is presented with a "service to you" idea. It must be clearly held in mind that the average client cares little who his architect is if he gets what he wants.

In the automobile field the day has come when the name of a car is sufficient guarantee of its quality. In a measure and among a few broad gauged people the same is true in architecture, but the rank and file of the average prospective clients do not know one architect from another except in a very general way. In fact among a large majority of people the word "architect" means an expensive luxury that must be avoided by practical people. To become so well known that the mention of the name suggests the quality and nature of a service is most desirable, of course, but is only possible through years of carefully planned publicity. Word of mouth advertising is the best sort always, but its scope is very limited, and it seldom builds up a broad field of activity.

The architect must meet his selling problem at an earlier stage in the mental process of his client than he has been doing, and the means of accomplishing this deserves the most careful study. The first step in determining a logical plan of publicity is a survey of the fields of building construction that are being covered. The questions must be asked, "Just who are my clients?" and "Why am I equipped to handle their building problems?" A consideration of the training and personal equipment of an architect's office will often reveal a broader field of activity than is at first realized. For instance, hotels, hospitals, apartment houses and institutional housing projects are closely allied architectural problems although widely different types of building from the users' points of view, and prospective clients should be sought by wholly different methods.

The next step is the determination of the most natural means of directing the attention of the prospective client to the architect's service without forcing him to a consideration of selecting an architect before he is ready to do so. At this time the news columns of trade magazines offer the best means of general publicity for the architect. Trade and class magazine editors will be glad to receive well written material on many subjects of interest to their readers. Many of the buildings which an architect constructs can be made the basis of descriptive articles and interviews which should be published over as long a period as possible. Such articles should always contain items of human interest, statements by owners, etc. A careful study of the trade and class magazines will determine the type of material each most readily prints. Another good source of publicity lies in the intelligent use of newspaper reports. When an important project is being launched or a building started or completed, careful reports should be prepared in the architect's office. Newspaper reporting has become such a standardized process, and newspapers are so accustomed to receiving usable material from the scores of press bureaus maintained by as many organizations, that often the less important projects go unnoticed if the story has to be sought out laboriously by staff reporters.

Architects should study news writing and prepare brief descriptions of new buildings, incorporating items of general interest whenever possible. If identical copies are sent with good photographs to all newspapers within a radius of 200 miles of the buildings, it is likely that a majority of the papers will publish them. They should be marked for release on a certain date several days in advance of the mailing to insure simultaneous appearance if the papers' editors desire. If 12-em (one-column) or 24-em (two-column) electrotyped cuts or mats of 65-line screen can be sent instead of photographs, publication will be more certain.

All such articles should be reprinted in quantities and mailed to prospective clients whenever they provide matter of direct interest to someone. These should always be accompanied by a brief but well written letter calling attention to a specific point of the architect's service which applies particularly to the proposed new work.

Under a well-conceived plan of publicity, carefully prepared loose-leaf monographs are of great value, for they can be kept up to date and used in giving clients a comprehensive survey of the fields in which they are interested. These monographs

should include the work of other architects, and should give the prospective client as broad and unbiased a concept of the general type of building he proposes to construct as can be had. If the architect has kept in touch with the industrial development of the community in which he is practicing, he should be able to anticipate the needs of a large majority of the industrial and philanthropical institutions, and be able to use these monographs in establishing a contact with prospective clients whom he believes are in the market for additional building.

The most should be made of executed commissions in the smaller communities. No member of any board or building committee with which an architect has had a connection should be allowed to forget the fact that a certain architect performed a certain work. They are often members of other boards, and are generally prominent business men. The full scope of the architect's practice should be brought to their attention.

Encourage the men of the staff to bring in new work. Do not forget that every man, however humble may be his part in the organization, may have connections through which publicity can be obtained and lead to valuable commissions. Besides, keeping the man's interest in the office will introduce new clients to its service. Some of the work from this source may be small, and for larger offices will just about pay for the cost of producing drawings, but a new client is always an asset, and if the architect builds a $10,000 house successfully, the client is likely to come back with a $500,000 factory some day, or school building or church or hospital. Architects now make a practice of doing the minor work of clients who have come to them for important commissions. Why not reverse the process? Take the small jobs first, and trust that the client will become influential in other large building projects later.

In all these suggestions the attempt has been made to include but a few of the important elements which an architect may use in laying out his plan of publicity. There is no set rule. Each office will have to determine for itself what specific items will best promote its growth and keep its name before the larger number of potential clients. One thing is important to consider,—no plan of publicity, however carefully it is laid out, is apt to bring immediate results. If an architect expects that his advertising and selling effort, which is established as a new and aggressive policy, will bring him tangible results within a few months, he will be disappointed, for his efforts will probably go unrewarded for a year or more. Such a condition should not discourage the use of a logical plan, however, for it has been the experience of many other concerns that are now firm believers in advertising.

"What does the advertising dollar buy?" It buys insurance for the future of the user's business. It buys the necessity of careful codification of the purposes and policies of the firm. It buys the respect of the modern business world, if done honestly, as well as the respect of every member of the firm's staff. Many users have found advertising to be the panacea for all the ills of organization and selling. It is not unreasonable to believe that a more general use of carefully planned publicity by architects will produce similar results.

Garden House, Roof Garden, University Club Building, Los Angeles
Allison & Allison, Architects

The Influence of the Empire Style

GENERAL CHARACTERISTICS

By AMELIA MUIR BALDWIN, *Interior Decorator*

PART I

DURING the brief period of Napoleon's triumphs a style of decoration developed in France which strongly influenced contemporary designers in other European countries and in America; and quite recently, beginning about one hundred years after it first flourished, a revival has taken place, so that we frequently see modern rooms done in the empire style—of the French, Italian or American versions—or with empire influence.

The style was formed by two architects, Percier and Fontaine, who worked together from the time they met at the school of Peyre, the younger, in Paris in 1779 until Percier's death in 1838, Fontaine continuing until he died in 1853. After six years of study in Paris they went to Rome and later, during the revolution, to England. Equipped with this long training and steeped in the classic reaction of the time, their great opportunity came when the painter David introduced Fontaine to Napoleon, then first consul, and they received the commission to redecorate the country house of Malmaison.

This beautiful home of the Empress Josephine was completely furnished in the new manner; paneled walls were painted with floating Pompeian figures or with a small motive of vase or lyre in the center of a large space, which was supported by a plain dado of simple and narrow projections. Desks and tables and chairs showed their direct derivation from ancient models, and the fine bronze work in lamps, furniture decorations and necessary hardware was severely classic in feeling.

It was the result of a fresh view of the classic styles and appeared as a swift dramatic change from eighteenth century decoration with only a very little transitional feeling in the Louis XVI and directoire periods. The classic revival began under Louis XVI, but the graceful style of that time had none of the precision and stoicism which came with the empire.

As Napoleon progressed in power Percier and Fontaine were called upon to furnish libraries and bedrooms and to set up thrones in various existing

Morning Room with Empire and Directoire Furnishings
Fakes, Bisbee & Robertson, Inc., Decorators

Hallway with Marbleized Walls and Woodwork
Chandler W. Ireland, Decorator

palaces. The dramatic quality of his career is especially felt in the salon of Louis XIII at Fontainebleau. The original elaborately carved dado remains, but above it a plain velvet hanging with narrow border decoration covers three walls and forms a background for the standards emblematic of victory which support the canopy, and the round-backed throne chair with the N in a wreath of laurel. It is a strong decorative treatment, expressive of self-control as well as mastery over others and a grasp of affairs. In contrast to it the remaining wall of the room, with the portrait of Louis XIII in the overmantel and every space thick with ornament, seems hopelessly self-indulgent and ineffectual.

Within a very few years it has been customary with us to praise the French eighteenth century styles, especially that of Louis XVI, and to shrug the shoulders when French empire was mentioned. In this connection it is interesting to read the views of Percier and Fontaine as set forth in the preface to their "Recueil de Decoration," published in 1801 and reprinted in 1812. They say that "the eighteenth century is known by its bad taste," and they feel that in their work they have preserved the principles of taste as found in antiquity in a unity of truth, simplicity and beauty, which are most acceptable to a people tired of the innovations of two centuries. They have sought to revive the simplicity of the antique, "in fact the most antique, the Greek." They speak of the recent discovery of a great number of Doric temples, which has produced a sort of revolution in art, so that "Greek taste has become the mode."

The furnishings of the houses of Herculaneum and Pompeii, all in imitation of the Greek, with pure and simple lines and correct proportions, are serving as models for the French work which is replacing the irregular contours of the previous century. These villages, "Greek in origin, carried on the usages of the Greeks," and engravings of "the multiplicity of objects of art and taste" found there are being used in all the ateliers of the industrial arts in France. These articles show "nuances of style and delicacies of ornament which are more Greek than Roman."

In parts of this preface Percier and Fontaine sound extremely modern. Their method of approach is the same which we use today—the study of ancient models and the conscious adaptation of them to our needs, with the hope of retaining something of their spirit and expression. Theirs was the age of the beginning of historical imagination. French actors playing classic parts were wearing red heels when David undertook to design correct costumes for them. Percier and Fontaine rail against anarchy and caprice in decoration, and ob-

serve that the same spirit exists in all the works of the ancients —"the largest and the smallest, in the temple and the vase of clay." They point out the intimate relation between construction and decoration, and speak of the influence of material and method on design. As an apt illustration they say that the gilded porcelain vases of the previous century were bad, "because this material has not the finesse of precious gold."

Every age which admires the classic styles gets out of them as much as it is capable of appreciating in feeling; and it is interesting in this connection to compare the work of Percier and Fontaine with that of Robert and James Adam, who were also inspired by the discoveries in Herculaneum and Pompeii. The French style is richer and more precise, partly because it is French and not English; but doubtless also because at that time the French people especially desired that pomp and order should replace the chaotic conditions which followed the revolution. It was a timely expression of their mood and a fitting vehicle for Napoleon's dreams of empire. What style could better suit his ambitions than the symbols of the Cæsars arranged with military precision?

The spell which Napoleon cast over his world was responsible for much of the immediate influence of empire decoration in other countries; but at the present time, as we are no longer moved by this particular form of hero worship, we must look for other expressions than those of military victory, if we are to make the style our own. When, however, we discard everything in it which is directly emblematic of the glory of Napoleon and the empire—the N, the bee, the palm, the laurel wreath, the Roman chariot, the Egyptian figures, the trophies and the ermine —we find that we still have the style. It is a distinctive and extremely decorative rendering of classic forms, in which the realism of the late eighteenth century is replaced by highly conventionalized ornament, applied structurally, with strong contrasts in color and proportion. It has not only order, but moderation as well, and balances strength with delicacy and richness with restraint. It shows the consistency in details which we consider typical of the French, every smallest piece of hardware bearing the imprint of the period, and all the furniture, even to the embroidery frame, being specially designed in the style.

Certain colors belong to the period, and they are combined to get all the effect of contrast possible—as in black and white marble floors, brass ornaments on mahogany furniture, deep blue and gold damask, yellow medallions on a violet satin ground, and delicate green, medium blue and rose on the pale gold ground of a toile de Jouy. This style is not one with the emotional effect of indefinite or blended

An Empire Mantel of Red Lacquer and Marbleizing
Chandler W. Ireland, Decorator

colors; everything is quite distinct and clear, with no sense of illusion, as if in the bright light of intellectuality.

Another important characteristic is the contrast in proportion made by the use of large rest spaces in the plain surfaces of marble, wood and fabric, with small scale ornament in medallions and narrow band borders. Straight lines are more frequent than curved, and for that reason the simple vase form of a pedestal table and the curves of an X-shaped stool stand out effectively in contrast to tables and cabinets and sofas which follow the structural lines of the room. In textures there is harmony rather than contrast, none of them being very rough and many quite smooth and glossy. The silks and velvets, and polished marbles and woods give unity and richness to the style. The classic ornament of rinceaus, arabesques, and grotesques in panels, borders and medallions, have thin delicate lines and slight projections in accordance with the precepts of the "Recueil." The lyre, vase and dolphin appear in simplified drawing which makes them all the more decorative; the swan's neck, ram's head, horn of plenty and eagle are familiar to us through their somewhat heavier forms in American empire work.

If we feel the style sufficiently, it is not difficult to use it creatively at the present time to make something delicately French or in the more substantial feeling of the American empire; or we can harmonize the two manners and use the furnishings of both. The style is well suited to city houses and apartments, where plain spaces in walls, furniture or rugs give the restful sense we need, and the general air of sophistication and commanding efficiency is in accord with the life of our day. This absence of naivete is everywhere felt, even in the upholstery of the period; pillows are never of soft feathers, but of hair and boxed, and the chairs in Josephine's bedroom at Malmaison have the trimmest outlines which are possible to a skilled workman.

We might adopt the style as an expression of the beauties which reside in efficiency, if only we know how to find them there.

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A Dining Room Arranged in the Empire Style
Miss Gheen, Inc., Decorators

Plate Description

University Club, Los Angeles. Plates 57-64. In the development of this building, of which Allison & Allison are the architects, there has been careful and skillful handling of opportunities for architectural expression which were unusual. The structure occupies a plot of considerable area, part of which is occupied by the club's garage, a one-story building, the flat roof of which, at the level of the main floor of the club, has been developed partly as a terrace or roof garden and partly as courts for squash and handball. The placing of this one-story structure at the south side of the property has made possible a southern exposure for all the principal rooms of the building.

The design of the building shows an appropriate use of materials which are quite simple, the modified Spanish style lending itself well to development in concrete. About the principal entrance and across the lower part of the facade use has been made of cast stone as ornament or facing, but the greater part of the building is of concrete covered with only a slight coating of plaster which does not conceal the marks of the forms which in the broad, well-proportioned surfaces of the walls produce a certain texture. The high-pitched, steeply gabled roof which is so valuable from a standpoint of design contains all the roof equipment—the tanks, motors and other utilities which so often disfigure a building, and the chimneys and stair and elevator towers have been so handled that each performs a part in creating architectural character.

But the full excellence of this notable work is hardly realized until the restrained and thoughtful development of the interior is seen. Like a hotel a club offers an opportunity for the use of gorgeousness upon a lavish scale, a temptation which is not often resisted. Here, while no provision for the comfort which should characterize a club's home has been overlooked, there has been consistent use of those traditional forms, Spanish or Italian, which carry out the spirit expressed by the exterior of the building. The interior shows, therefore, an admirable use of ornament in connection with plain surfaces, luxurious yet restrained, and in no way suggesting that primitive austerity which comes to the minds of many when these Latin architectural styles are mentioned. The same excellent taste which directed the use of interior ornament in the club evidently supervised the designing of the furniture and other accessories which do so much in carrying out the spirit of the building. The furniture, which adheres to consistent use of Spanish or Italian models, was specially designed and made, and the same is true of the lighting fixtures, wrought iron excepting in the main dining room. Even the marked-off cement floors are beautiful and remarkably full of character. All this work was done by Los Angeles craftsmen, which adds to its interest.

Building for Crane, Limited, Montreal. Plates 65-67. This structure was built for use as salesrooms, stock rooms and executive offices for the Canadian branch of this large manufacturing concern and supplements an extensive plant in the environs of Montreal. The interesting appearance of the building, of which Hugh Vallance is architect, is due to a large extent to the peculiarity of its site, for it is situated at the point where a street widens out into Beaver Hall square. This irregularity of frontage seemed at first likely to create considerable difficulty in securing satisfactory architectural elevations, but in working out the design it led to the development of a treatment which is unusual and which adds materially to the attractiveness of the building as seen from the little square.

The structures which face Beaver Hall square, which is in the heart of an old part of Montreal, are of moderate height and built of local limestone. It was thought desirable that this structure for Crane, Limited, should fit into the locality without creating a jarring, discordant note, and excessive height was avoided, while use was made of the same limestone of which the fronts of the older buildings are made. The highly satisfying architecture of the structure is rendered even more pleasing by the use upon window trim and elsewhere of a gray-green color which contrasts well with the limestone of the walls.

The building is fireproof and has steel columns and floor beams. Local limestone, as already said, has been used for the exterior walls, base and steps being of granite. Windows are chiefly steel casements with plate glass. With the exception of a small terrace which is laid with tile the roofs are of 5-ply roofing with flashings of copper. Floor loads differ considerably, according to the uses for which various portions of the building were intended, from 60 pounds per square foot for the office section to 150 pounds for the display rooms, and from 300 to 500 pounds for the stock rooms. Heating is provided from a low-pressure steam equipment.

In keeping with its unusual and distinguished exterior the interior has been finished with considerable care. The floors of the lower story and the stock room floor are of concrete on steel beams. Finish floors of travertine are laid in the entrance lobby, the main floor and the principal display rooms. For minor display rooms, halls and offices use has been made of cement floors covered with a specially prepared finish with marble cove and base. Vestibule screens, elevator doors and frames are of bronze. Walls and ceilings are painted throughout, the chief display rooms and certain of the bathrooms having dadoes of tile. The contract for the building was placed in October, 1921, and the structure cost, without furnishing, $305,800, or about 68 cents per cubic foot.

EDITORIAL COMMENT

VOLUNTARY ARCHITECTURAL CENSORSHIP

AS one passes through our rapidly growing American cities, where the hand of the speculative builder is so much in evidence, a wish often comes to mind that some method could be devised for preventing the erection of monstrosities that destroy the natural beauty of suburban areas and offset the value of such well designed buildings as may exist.

In various cities architects have given thought to the problem, but without any mandatory powers little has been accomplished; in a few cases the loaning interests have been appealed to and the attempt made to induce them to recognize the greater financial security resting in a well planned and designed building; the effects are not continuing, however, because the traditional use of bonuses and other emoluments in times when funds are in demand places the emphasis on purely business considerations, and æsthetic principles are lost.

In all matters of this kind the simplest plan by which the co-operation of the direct factors can be assured is the best. In Washington such a plan has been put into practical effect, and its success points the way to the accomplishment of similar results in other cities. Washington is unique among American cities because of its being the capital city, with the interest of all Americans in its development; it is also an indication of our general culture to great numbers of foreign governmental visitors who often do not see other cities so intimately. It is likewise unique in having its development placed in the care of congress, and in common with much other congressional action there is criticism to be made of the results and methods.

A history of the development of Washington shows a roster of names of architects who have been leaders in the profession; their time and talents have been freely given to the nation's capital, and as a result of their labors Washington has a fine arts commission that supervises a great park system and public building program. These plans are admirable in scheme, but deficient in execution because of congressional handicap; there has been no broad plan of street development nor any control of private building that links up the work of the commission with the general development of the city, and as a result thousands of acres of beautiful rolling and wooded country into which the city has grown have been reduced to ugly wastes through the unintelligent work of the speculator.

With the thought that there was still time to prevent further spoliation, the Washington chapter of the American Institute of Architects appointed an investigating committee in July, 1922, to report on the possibilities of rendering assistance in the development and beautification of the city. Two possible lines of action were proposed: First, the need of restudying the plan for the extension of the business and residential streets to minimize large grading operations with destruction of existing landscapes. Second, the need of some advisory body to extend æsthetic supervision to private buildings.

At the start it was determined to make of the work a non-organization matter, and accordingly all architects of Washington were invited to co-operate in evolving the necessary machinery for putting the scheme into operation. They were asked to nominate men for two different services—the younger men, who had certain free time to give to the varied details in co-ordinating the building interests and interesting the public in the movement, and the older men of established ability and reputation as jurors.

The proposal met with general favor among the architects, and there was formed a directing organization known as the Architects' Advisory Council. All of the service has been rendered gratuitously, and the work divided among a number of architects so that the burden has not fallen on a few.

The council enlisted the aid of the building department of Washington and secured from the commissioner an order that all plans filed for permits should be submitted to the architects' jury for approval before issuance of permits. This has made it possible to bring the plans for every private building before the jury for review. The examination of plans is done in a meeting called as the drawings come from the building department, so that no delay is caused. The members of the profession have shown a very generous spirit of co-operation, and their plans are often submitted to the jury before they are beyond the study stage. The recommendations of the jury are not in any sense mandatory, but in the great majority of cases are graciously accepted. It is, of course, not so much with established architects' work that the betterment is needed as it is with the product of the speculative builder and the young, inexperienced architects. The council in its short term of existence has been able to eliminate the atrocious perversions of the orders which the speculative builder is so fond of perpetrating; the false pediment with metal tiles and other mockeries of architecture have been likewise relegated to the scrap-heap. The change for the better is already noticeable, and it is due entirely to the public spirited, self-sacrificing labor of architects. This same spirit prevails in other cities, and with the Washington example before us, it is our hope that architects generally will go and do likewise.

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Architect, Raymond Wright, Syracuse. Specifications in Sweet's Eighteenth Edition, pages 442-447.

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A-15

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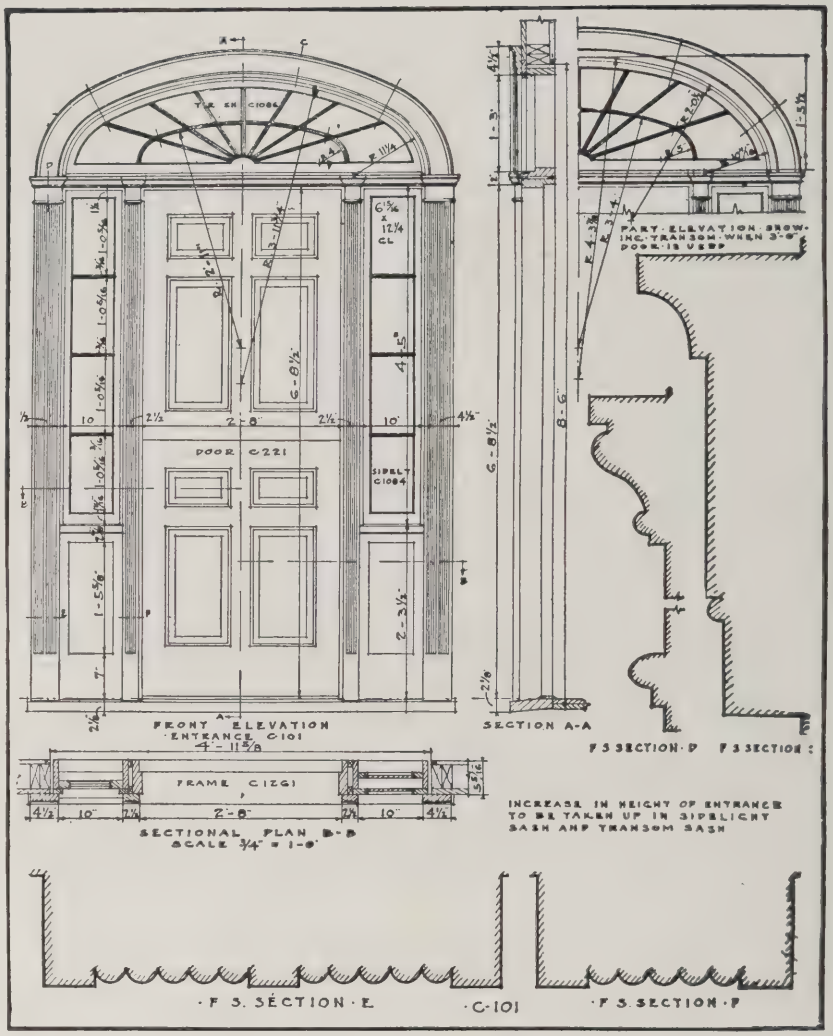

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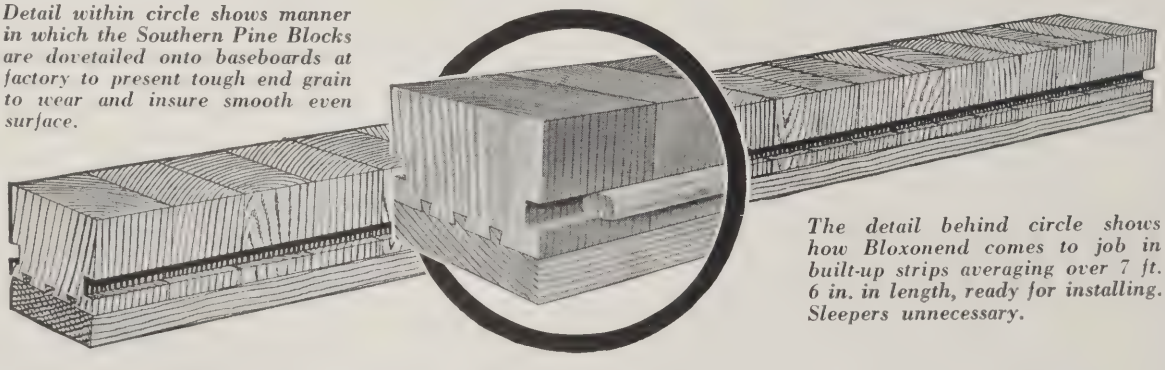

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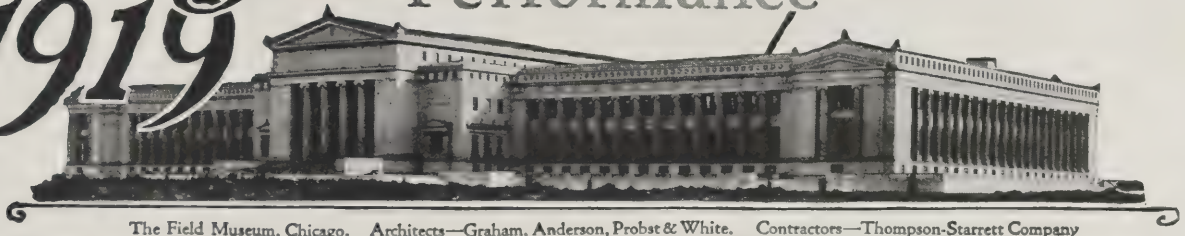

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BOOK DEPARTMENT

EIGHT CHAPTERS ON ENGLISH MEDIÆVAL ART: A Study in English Economics. By E. S. Prior, A.R.A., Slade Professor of Art in the University of Cambridge. 147 pp., 5½ x 7¾ ins. Illustrated. Price $2. The University Press, Cambridge; The Macmillan Co., New York.

ONE of the cheering signs of the times is observed in not only the growing interest being felt in architecture but also in the rapidly increasing interest, broadly manifested, in all the many forms of what are sometimes called the "liberal" arts which have throughout all the ages contributed so generally to architecture's triumphs. No more certain proof of this live interest could be sought than the publication of many works dealing with these intimately related arts, and as the number of such books increases and study of them first arouses and then increases interest, there are built up a larger and stronger body of craftsmen and more intelligent patrons of the arts, and this in turn leads to the publication of more works which broaden the interest.

England's wealth during the mediæval centuries made possible the development of the land into a rich storehouse of architecture and art in many forms, while comparative peace has meant the preservation of much of this rich heritage. Vast stores of priceless treasures were destroyed, it is true, in the upheavals of the sixteenth century, but England has not been invaded since the time of the Norman conquest, and the reformation, while it bore with heavy hand on painting, sculpture and glass, left architecture to a great extent unscathed.

Mr. Prior's writings are particularly interesting by reason of his clarity of view and his happy faculty of fluent expression. With a wealth of material at hand in England and with added wealth accessible upon the continent but a few hours away he has had many opportunities of studying at first hand the masterpieces of architecture which time has left, and for his readers and students he presents vividly in his writings the works of architecture themselves and the glories of the auxiliary arts which contribute to them, while he clothes them with added interest by inclusion of enough of their history to make them, for the reader, intimate part and parcel of the times when they were created.

In this useful and interesting manual the author covers the mediævel development of architecture and the related arts at the hands of the English. Especially informing is his treatment of monastic architecture as compared with the cathedrals and other structures built by the bishops and their secular priesthood, and to render all this more readily understood as well as more interesting Mr. Prior writes authoritatively of the social history and political movements of the times.

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OF ALL the architectural types, that most appropriate for American domestic use is often thought to be that of the old English cottage or farmhouse. It can be easily developed in materials of almost every kind; it possesses wide flexibility as to scale, and the character of its fenestration provides the ample wall spaces which many designers highly value for their architectural effect. Its interior is readily developed to provide the rambling type of plan which is popular for country or suburban domestic buildings, and all in all, the English farmhouse or cottage answers every demand made by the modern home builder in the search for a practical type.

THIS important work presents half-tone illustrations from photographs or sketches of more than 100 English country houses of the cottage or farmhouse types, chiefly in the Cotswolds and in Sussex, Suffolk and Kent. It deals with the work of three centuries and illustrates buildings of several widely different kinds of old English domestic architecture, built of wood, plaster, stone, brick, or combinations of all these. There are also given countless detailed working drawings of doorways; oriel windows; gables; chimneys, singly or grouped in stacks; decorated plaster; half-timber work; fireplaces and cornices. A book invaluable to the architect.

102 pages, 10 x 13½ inches. Bound in cloth. Price $15.

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In excellent half-tone plates, chiefly of full-page size, there are illustrated different rooms of late Georgian houses,—halls, living rooms, libraries and dining rooms, and such details of interiors as mantels, door and window frames, stairways, columns and pilasters, and ornament in relief upon walls and ceilings. **An invaluable detail of the work is the inclusion of drawings from which many of these details can be reproduced.**

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A SHORT HISTORY OF ARCHITECTURE; EUROPE. By Russell Sturgis, A.M., Ph.D., F.A.I.A. 578 pp., 5½ x 8 ins. Illustrated. Price $2.50. The Macmillan Co., New York.

ONE is frequently asked to recommend some work on architecture which will aid a young student in his studies or promote the better understanding of what architecture really is by someone whose interest has been awakened. For this latter class there are now several admirable works dealing with the appreciation of architecture or concerned with its appeal to taste, but actual histories of architecture are likely to be so large, bulky and costly that to recommend them would be to discourage the inquirer or to tax his interest with rather more of an investment than it would usually warrant.

In this volume Mr. Russell Sturgis, who was widely known for his writings of several kinds upon architecture, presents an admirable short work upon its development in Europe. It is not easy to cover a subject so extensive in 546 pages of average size, but Mr. Sturgis has done it with no sacrifice of anything in the way of essentials and indeed without the omission of many non-essentials that would add to the interest of the subject-matter. No history of European architecture should fail to do justice to the importance of the work of Greece and Rome, the foundations of all that followed in Europe; but while these epochs of architecture's history have been here adequately dealt with, greater emphasis has wisely been placed upon later developments. We particularly admire the presentation (in Chapter IV) of the rather difficult subject of Romanesque vaulting, and of the excellent treatment (Chapter V) of vaulting and groining with its attendant consideration of thrust.

The treatment of the renaissance in different countries of Europe naturally occupies a considerable part of the volume, and particularly interesting is the handling of the renaissance in England, especially during the era which began with the restoration when with England once more under a stable government a fresh impetus was given to architecture and building. Discussion of this period has naturally involved considerable notice of Sir Christopher Wren, and among the illustrations in which the work abounds there are given a number of illustrations of Wren's city churches, so many of which seem doomed to speedy destruction.

MODERN DECORATIVE ART IN ENGLAND. By W. G. Paulson Townsend. Volume I. 149 pp., 10 x 13¾ ins. Illustrated, largely in color. Price $10. B. T. Batsford, Ltd., London; William Helburn, New York.

ART as applied to industry is naturally subject to the changes and fluctuations which fashion and custom require of the industries which serve them. Change of taste is not confined to personal dress,—it affects quite as much the furnishing of the houses in which we live, and with each of the many whims of fashions changes must be made in the designing of all the household adjuncts into which design enters. Such changes take place everywhere; perhaps they are no more radical in England than in America, but the author of this work, in the preface, says that in England changes come with such rapidity that it results practically in a continual revolution, and that with a view to placing on record the course which decorative art has pursued during the past quarter-century, publication of a series of illustrated volumes—of which this is the first—has been undertaken, others to appear presently.

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AMERICAN architecture includes no domestic work more distinctive and full of character than that of these Philadelphia architects, and few designers are as able to bestow upon a building the appearance of spacious, informal dignity desired today and expressed in the work of this firm.

¶ Here there is presented in one volume a review of most of their best work. It includes large half-tone cuts from original photographs of residences, chiefly country or suburban, of other domestic buildings, farm structures, a few clubs, college or fraternity buildings, and a number of structures of other kinds. Most of these items are accompanied by plans and other drawings, sections, and details of interior trim. The materials used in these buildings are wood, stone, brick, stucco, and combinations of all these, and the structures illustrated are of many widely different architectural styles, each interpreted with that taste, skill and close attention to detail for which the firm is well known.

¶ Many of the items presented here include loggias, terraces, gardens and other out-of-door work which is developed with the care and thought which characterize the buildings themselves, and full plans of grounds and gardens accompany most of the illustrations. This is a volume which should be included in the working library of every architect and landscape architect.

212 pages; 12 x 16 inches; lavishly illustrated with half-tone plates of exteriors and interiors; printed on heavy coated paper, and bound in cloth.

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The record of design made by lace and tapestry and such printed textiles as chintz, linen and cretonne is here pictured; embroidery and batik are given their pages, and much of the work is devoted to wall paper of different kinds. As in all the English works of this character the illustrations are excellent; countless pages are in full color, and the volume is of great interest to the worker in any form of art which enters into industry concerned with textiles or wall coverings. We should be reluctant to believe, however, that any changes of fashion could bring about the disuse of many of these excellent forms, which are beautiful enough to last.

BE YOUR OWN DECORATOR. By Emily Burbank. 331 pp., 6 x 8¾ ins. Price $3. Dodd, Mead & Co., New York.

IN the preparation of this volume the author has had what might seem to be two separate and distinct aims, for in addition to striving for the appropriate decoration of houses she has undertaken to make the home owner sufficiently familiar with interior decoration to carry out the work herself. The attaining of these objectives would, of course, result not only in well furnished and decorated houses, but also in so raising the standard of public taste that people would know the value of good decoration and be able to secure it for themselves.

Many people fail to realize that a house well decorated is generally a house comfortable and practical—a place in which its owners delight to dwell. Interior decoration, like art in any form, is often misunderstood and is regarded by people in general as being something so remote and abstruse that it has no direct bearing upon their lives. Of course the exact opposite is true, since interior decoration is perhaps the form of art with which people come into the closest and most intimate contact. Its influences are felt, though they are not always understood, and proof of this is found in many instances where members of a family are drawn to some particular room without exactly knowing why; it will be found usually that it is attractive by reason of its comfort and harmony which make for repose—or, in other words, because it is well decorated.

Since this work is intended for the guidance of amateur decorators its arrangement is simplicity itself, a few of the chapter headings being "Making What You Own Attractive," "How to Add to What You Already Own," "What Colors Go with What Shapes," "Chintzes and Cretonnes and How to Use Them," and "Framing and Hanging Pictures." One chapter of particular interest and value is headed "Rooms the Men of Your Household Will Like," and an especially helpful feature of the book consists in its suggestions for arranging rooms which are practical and livable.

THE EARLY NORTHERN PAINTERS: Their Art and Times as Illustrated from Examples of Their Work in the National Gallery, London. By Mrs. C. R. Peers, 214 pp., 5½ x 8½ ins., 25 illustrations. Price $3 net. The Medici Society, Boston.

THE student of painting who enters the National Gallery visits one of the great collections of the world, rich in paintings of every period, but in few more complete than in that period during which flourished the northern primitives, such as Van Eyck, Memlinc and Gerard David. Mrs. Peers' interesting and useful work, as its title suggests, is not precisely a guide to the subject which she discusses, for there are countless vol-

A floor of Armstrong's Cork Tile in the Want Advertising Department of the Leader-News Building, Cleveland, Ohio. The pattern is composed of six-inch squares of light and medium shade tile, with two-inch dark and variable light border

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umes which treat in a more critical and technical fashion the work of these painters of the north; rather it might be described as a highly readable and instructive account of the paintings, of the painters themselves, their lives and times, and the conditions under which they worked.

More than most painters the primitives worked into their canvases the history of their times. Architects and students of the periods of decoration depend for authoritative interior architecture upon the works of one of these great men; another portrayed with exceeding care the costume of the period, while many of these early paintings are of interiors, from the open windows of which appear glimpses of fifteenth century Ghent or Bruges which afford the historian no less than the architect or the archæologist an excellent idea of the appearance of those cities at the time concerned. For all these and for many other reasons the work of the northern primitive school of painting possesses an interest and a value which is unique.

PROGRESSIVE SUGGESTIONS FOR PLANNING CHURCH BUILDINGS. Edited by Rev. Elbert M. Conover, assisted by Albert N. Dobbins, Architect. 48 pp., 7¾ x 10½ ins. Price 50 cents. The Home Missions Council, 156 Fifth Avenue, New York.

THE study which is being given to the small church building, particularly in rural or semi-rural communities, is suggested by this little book. It is in no sense a collection of stock plans, since as is set forth in the preface it is not expected that any of the plans shown will be copied by church building committees. Difference of location, surroundings, needs of people to be served and extent of resources available demand a thorough and separate study of each individual case, but the illustrations given here afford suggestions which could hardly fail to be of help to building committees as well as their architects. The book suggests what may be done with building appropriations of different amounts. Several of the smallest churches shown are among the most interesting, while many of those of larger size are extremely good from an architectural point of view. Different materials are used—wood, brick, stone, and combinations of all these. The book is issued by one of the boards of the Presbyterian body, but the designs are suitable for the use of any of the evangelical denominations. One particularly helpful detail is the listing of numerous other works on church building.

THE BRIC-A-BRAC COLLECTOR. By H. W. Lewer and Maciver Percival. 256 pp., 5 x 7½ ins. Price $3. Dodd, Mead & Co., New York.

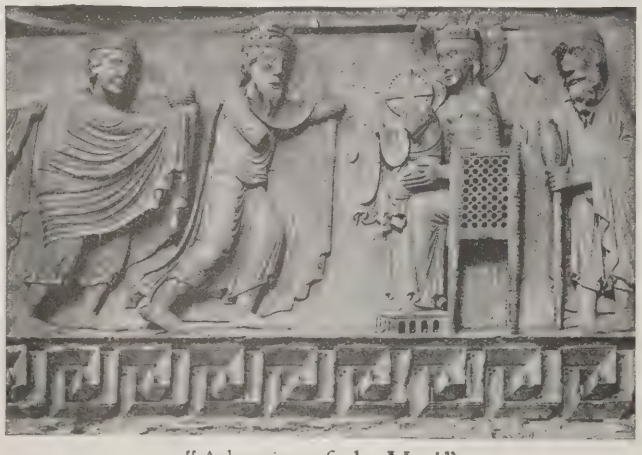
WITH interior decoration assuming an increasing importance in connection with the practice of many architects it is not difficult to realize that antiques sustain a certain relation to architecture.

This interesting volume, the latest of "The Collector's Series," includes chapters of considerable extent upon forms of antiques which enter into decoration, such as lacquered ware in various forms and needlework of different kinds which is useful in screens and for furniture covering. Study of the times of which these and many other objects dealt with here are a part is an aid in arranging interiors in the different historic periods.

ROMANESQUE SCULPTURE OF THE PILGRIMAGE ROADS

By ARTHUR KINGSLEY PORTER

STUDY of the Romanesque architecture of France and northern Spain is closely related to study of the Gothic which rose later throughout western Europe. In all the Romanesque buildings, as with the Gothic, sculpture played a highly important part, and the freshness and vigor of the styles depended in no small measure upon the wealth of carved ornament which adorned the exteriors of churches, cathedrals and chapels, particularly their facades and portals, and which extended to the interiors, especially to such accessories as altars and screens. This astonishing flowering of the sculptor's art was the direct outgrowth of the travel which during the eleventh and twelfth centuries went on to and from the shrines which attracted religious pilgrimages.



"Adoration of the Magi"
La Charite-sur-Loire, Nievre

IN this magnificent work the author records in a wealth of halftone illustrations the present state of the Romanesque sculpture of the religious buildings of southern France and northern Spain, while in the accompanying text he traces the beginning and rise of the Romanesque school and describes the various types which became identified with different regions, giving detailed information and the dates of most of the pieces illustrated. There are few works on sculpture which are more helpful to the architect who would be accurately posted as to the sculpture and ornament of this important epoch, or to the student who is concerned with the study of sculpture and its important influence upon the development of the different architectural styles.

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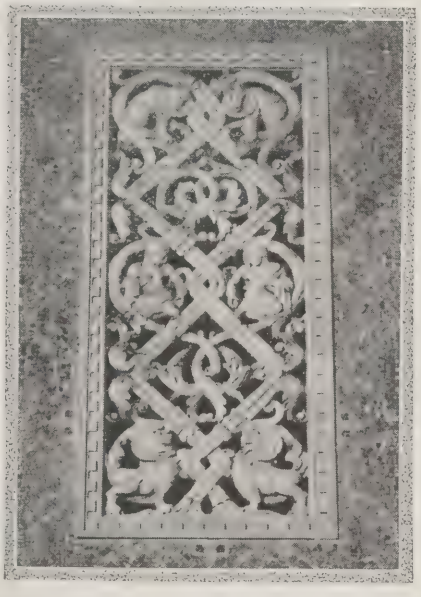

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The ARCHITECTURAL FORUM

VOLUME XXXIX — NUMBER 5

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ALBERT J. MacDONALD, Editor

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THE EDITOR'S FORUM

TRIBUNE TOWER COMPETITION

TO sum up and record in permanent form the results obtained in the competition for designs for its new building, the Chicago *Tribune* publishes in book form a review of the competition and illustrations of all the designs which were received. Particular mention is naturally made of the winning design, the work of Messrs. Howells and Hood, fully illustrated by many plates, plans and drawings; mention somewhat similar is made of the designs of Eliel Saarinen and of Holabird & Roche, while the remainder of the volume illustrates the large number of designs which came to the *Tribune* from 23 different countries.

"WOOD AS A BUILDING MATERIAL"

THE U. S. Forest Products Laboratory, Madison, Wis., which since 1919 has been giving demonstration courses in kiln drying of lumber, boxing and crating, gluing of wood, and wood properties, announces a new course covering wood as a building material.

The subject matter will be presented in lectures and demonstrations by the experts of the laboratory. The course will include some of the subjects that have been presented in the kiln drying, gluing, and other courses, which have been attended by hundreds of men from all parts of the country. In addition, the new course will take up the properties and uses of various species of woods in building construction; methods of determining the strength of wood; safe working stresses for structural timbers; effect of varying dimensions and of form of beam and joist on strength; decay in wood, its effect and methods of prevention; grading rules; moisture-resistant coatings, and fire prevention in wood construction.

The course for architects will be given December 10 to 15, inclusive. A co-operative fee of $100 per man will be charged to cover the cost of instruction. Further information may be had from the Director.

AMERICAN CONSTRUCTION COUNCIL

THE first annual meeting of the American Construction Council, following the organization meeting that took place in Washington in June, 1922, was held in New York on Friday and Saturday, September 21 and 22. At its sessions some of the most pressing problems awaiting solution by the building industry received practical consideration. The meeting of the council itself, following a meeting of the board of governors at the home of the president, Franklin D. Roosevelt, in the morning, which was attended by 35 members of the board and the public, was opened by a note of welcome from Mr. Roosevelt in which he expressed his faith in the great usefulness of the council and its field of helpful and constructive activity for the future.

Among the problems discussed were local autonomy and national organization in the construction industry (how the American Construction Council should aid in the promotion of and co-operation with local building congresses); apprenticeship, vocational guidance and craftsmanship in the construction industry; reduction of unemployment in the construction industry; the American Construction Council's program on research; and what the American Construction Council can do to help the various branches of the industry. Throughout the discussion emphasis was placed upon movements in actual existence or plans definitely being inaugurated by the various agencies throughout the industry and by the council itself. Thus matters pertaining to the organization and actual operations of building construction congresses in New York, Boston, New Jersey, Philadelphia, and Portland, Oregon, were given special attention by the speakers.

The great opportunity for constructive service by the council was evidenced in the pledges for support and the discussions throughout the various sessions.

WREN HONORED AT WILLIAM AND MARY

OCTOBER 20, the birthday of Sir Christopher Wren, was celebrated this year, the 200th after his death, at William and Mary College, Williamsburg, Va., which claims the distinction of possessing the only building in America actually designed by the great English architect.

Work upon the original main building at William and Mary was begun in 1693, the year of the institution's founding. The design of Sir Christopher Wren looked to a rectangular structure of monastic style, but the plans were carried out in part only. In 1705, 1859, and 1862 fire did great damage to the building, but restoration was made in each instance upon the old walls, which still serve their purpose. A movement to restore the building according to the Wren design is now gathering way.

The main building, according to competent contemporary authority, was modeled by Sir Christopher Wren to look "not altogether unlike Chelsea Hospital." The college founded under royal charter to prepare students for the ministry in the most English of the colonies, was most likely to win Wren's favorable attention. Chelsea Hospital was designed by him. He was devoted to ecclesiastical architecture, closely in touch with the leading prelates, designed several buildings at Oxford and Cambridge, and drew the plans for King William's Hampton Court. Under the circumstances, he was naturally called on to contribute to the success of a venture fathered by the Church of England.

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David Mulligan

Charles Gehring

THE Editors of THE ARCHITECTURAL FORUM take this opportunity to express to each member of the Editorial Advisory Committee and to each editorial contributor their sincere appreciation for the valuable co-operation extended during the preparation of this Hotel Reference Number. This background of practical experience has enabled us to present a treatise which will prove of enduring value.

E. M. Statler

J. Leslie Kincaid

EDITORIAL FOREWORD

IT is a source of gratification to us to present to the architectural profession this Hotel Reference Number of THE ARCHITECTURAL FORUM, the largest single issue of an architectural magazine ever published. This is one of the series of Reference Numbers, and, because to a great extent it is the work of others who have co-operated with us, we can perhaps take justifiable pride not only in the comprehensive and constructive editorial contents, but in the valuable array of interesting information contained in the carefully prepared advertising sections.

In this connection we wish to stress the fact that this Reference Number is not only a compilation of essential information for those interested in the design, construction and equipment of hotels, but that the Hotel Plan and Specification Reference Index (following the editorial section) constitutes a definite check list when plans and specifications are being prepared and approved.

In turning the pages of a recent issue of our esteemed English contemporary, the *Journal of the Royal Institute of British Architects*, we happened upon a review which epitomizes our editorial ambitions:

"This section of practice (hospital work) has been exemplified in a very remarkable degree in the December (1922) number of THE ARCHITECTURAL FORUM which is what is termed a Hospital Reference Number. Every sectional problem has been assembled and discussed in fifteen essays, voluminously illustrated and exhibiting a fine array of recent exteriors which are of remarkable and abiding interest and of real architectural value. This bulky quarto is set down in the midst of 170 pages of practical illustrated advertisements of hospital requirements of much interest and very suggestive, and, apart from the subject matter under review, deserving of more than passing notice."

Edward M. Tierney

E. H. Ahrens

L. C. Prior

David Knott

ENTRANCE—SEEN FROM PARK
LOS ANGELES-BILTMORE HOTEL, LOS ANGELES
SCHULTZE & WEAVER, ARCHITECTS

The
ARCHITECTURAL
FORUM

VOLUME XXXIX NOVEMBER 1923 NUMBER 5

Good Architecture, a Modern Hotel Requisite

By JOHN McENTEE BOWMAN
President, Bowman Hotels Company

TODAY, as in the days of wayside inns from which our great business has grown, the basic functions of the hotel are to provide comfortable shelter, good food and atmosphere. Any well constructed building will provide adequate shelter; good management bears the responsibility of food and service; but for atmosphere—that intangible contribution to the well being and satisfaction of hotel guests—we must look primarily to the architect.

Apart from his direct contribution of knowledge in respect to planning and equipment, the highest talent of the designer is called upon today in increasing measure to create hotel exteriors and interiors which attract and hold interest, establish correct impressions, and create memories which insure recurring patronage and recommendation.

Good architecture possesses the inherent faculty of moulding public taste. It supplies a setting which unconsciously appeals to all within its influence. Applied specifically, and assuming good service, it is usually architecture which primarily influences the choice of a hotel, a dining room, a lounge or a ball room.

Architecture presupposes conditions. For the main dining room of a hotel it suggests comfortable formality—dining in company with a lady—a harmony of form and color without distraction. How different again is the architecture of the grill—a man's room in every sense, reminiscent of days when men traveled the highways on venture bent—trade or travel or war. Here is the atmosphere of jovial masculine companionship—low ceilings and sturdy walls, rugged floors and picturesque, comfortable furniture.

There are also the essentially practical phases of good architectural design which often contribute strongly to the development of the hotel project during its early stages. The sketch plans provided by the architect, with interesting perspective views of exterior and interiors, usually form an important exhibit to accompany mortgage applications, bond offerings and lease negotiations. Architecture in this sense becomes one of the few forms of tangible previsions, and as such constitutes an invaluable adjunct during the stages of promotion and preliminary negotiations covering a highly important business project in which millions of dollars may be involved for investment purposes.

Aside from the elements of design, the hotel owner looks to the architect to assume the highly important responsibility of selecting structural materials and equipment and establishing rigid specifications to be carried out under his supervision. Only through dependable service of this nature is it possible to put into actual operation the complicated structure of a hotel which must combine artistic merit with a high degree of utility. Service demands as interpreted by the hotel owner and management must be translated into physical existence on a basis of economy consistent with the type of hotel service required for the individual project. Broad knowledge of the merits and deficiencies of all classes of building materials and equipment is required. For the hotel owner it is not a question of buying the cheapest available materials and equipment. First cost is important, but after all it is but one factor in an equation involving also the qualifications of long and satisfactory service to offset structural depreciation and costly replacements. This, too, is an important contribution which architecture makes to the hotel.

Under the daily pressure of service organization and management our appreciation of good architectural design may become as subconscious as its impression upon hotel patrons. Remove it, and its lack is felt immediately.

From the very inception of the hotel project to the development of its most recent innovation an almost primary demand is made upon architecture. Fine motor cars stop at fine entrances; social functions need impressive settings; discrimination calls for good taste. In varying degrees the modern hotel demands atmosphere which fundamentally is an appeal to the senses. Color and texture, mass and proportion skillfully disposed in a series of connotations,—this is architecture, and the true background without which the finest service would be little appreciated by the American public.

Service Analysis, the Key to Successful Planning

By E. M. STATLER
President of The Statler Hotels Company

THE heading of this editorial indicates a truism in hotel planning expressed by all, adopted by many, but accomplished by few. When a hotel project fails, the elements which prevented its success might have been eliminated by a carefully detailed preliminary study. With a passing word we may take for granted the importance of sound financing, correct location and good architecture; we may assume that in any analysis the type and general plans of the hotel will meet local requirements and establish a sound business prospectus. There is one test, however, which applies equally to the preliminary analysis of any hotel project, to the finished plans of the hotel, to the completed building and to its administration—it is the *test of guest service!*

In any hotel scheme the most important feature is rooms, and *room service* becomes of paramount interest in planning. Next in importance, and often almost equal in importance, is restaurant service. These elements of service, with their background of efficient planning, are the primary test factors in considering a hotel plan.

"Room service" is a broad term which covers not only meeting the requirements of guests but also the care which the rooms themselves require from employes of the hotel in order that they may be kept comfortable and clean without inconvenience or unnecessary contact with guests. The development of this type of service in the course of planning requires much thought and consideration in order that rooms may be easily accessible to passenger elevators and to service elevators. "Restaurant service" is highly important from the guests' viewpoint, and no consideration, even that of the provision of sub-rental space or concessions, should in any way detract from the accessibility and attractiveness of space given over to this purpose. In this connection a study must be made of kitchen and service department accessibility and equipment to promote speed in service.

Every hotel requires a different solution of these important service problems, depending upon the city, the location of the site and the dimensions of the building lot, as well as upon the character of the neighborhood. The location of the building site in any city is one of the most important points for consideration, and in turn it will determine the general arrangement of ground floor space and the exact purposes to which these space allotments will be devoted. Each division must then be studied, not only as to plan and approach but also as to its relative importance to the general first floor plan, its convenient inter-relationship with other departments, its service value to the guests, and its productive value from the investment viewpoint. The typical room floor must receive most careful consideration, based primarily on the requirements of the guest and service to him, realizing at the same time that wherever service is made easier for the employe the guest will benefit. In this manner, part by part, from sub-cellar to roof, a plan must be studied, thinking always in terms of those who will pay for this hotel service and humanizing every line and angle with the realization that one day this building will be an actual, operating machine.

This leads to another thought which should constitute an actual test of any hotel plan. To what extent is it necessarily complex? The trend of the day is toward large hotels, and even as one is amazed to see beautiful, vast cathedral buildings looming up above the small, cluttering villages of southern France, so is it amazing to encounter the sizeable hotels that are beginning to appear even in smaller cities and towns and the vast buildings which are becoming landmarks in the greater cities. With this tendency toward size there is a natural trend toward complexity from the viewpoints of planning, construction, equipment and administration. It is obvious, however, that the various parts of a large complex may be easily unbalanced in size and capacity. All space devoted to service activities is subject to a fine analysis which will limit its physical size without danger of establishing too small a capacity.

In too many instances the planning of hotels is carried out without consideration of the human element as represented by employes. The distances between kitchens and dining rooms are too great or broken up by stairs; service elevators are inconveniently arranged, and the help's quarters are located in inadvisable sections of the building, subject to difficult control by the housekeepers. This and many similar elements make for complexity, and complexity in plan, equipment and *service requirements* necessitates a greater investment, higher structural and maintenance cost, and a greater proportionate cost of the service rendered to guests.

Perhaps this question of detailed preliminary analysis may be boiled down to the term "plain common sense," but it must be the common sense of experience—and, consequently, the services required in establishing the proper preliminary analysis as well as in developing the finished structure include not only the skill and art of the architect but the detailed technical advice of engineers and, above all, the supervision of a practical hotel man equipped with a thorough knowledge of the many important and incidental problems which develop daily in each department. The architect can help the hotel man —the hotel man can help the architect—but alone, they both tread on dangerous ground.

Popular Features that Sell Hotel Service

By J. LESLIE KINCAID
Vice-president, United Hotels Co.

HOTEL operation in America has developed to such a point that operators of modern hotels, having run the known gamut of mechanical perfection, are now obliged to seek distinction in that field which in other days, as now, was open to even the humblest innkeeper—the most important as well as the oldest and the best "selling feature" of all—that is *personal service*. In fact, so successfully have hotel operators met the demands of their public for conveniences of a mechanical character, that our company stands quite ready to offer a prize to any traveler who will tell us of something that has been forgotten or that can be still further perfected. We have our valet service, our various cigar and newsstands, and bookstalls where the most recent fiction may be obtained; we have our theater ticket agencies, our elaborate barber shops, our hotel stenographers, and about everything else that will serve personal convenience.

As a matter of fact, in a well planned, modern hotel, I should say that practically every need of a guest is now provided for within the confines of the hotel building. I am thinking particularly of the mercantile stores, which, in a building like our new Hotel Roosevelt, in New York, will occupy the ground floor of the four sides of a city block. We are planning to make each of these stores distinctive and exclusive, each catering to some specific need of the hotel guest, without duplication of appeal.

Of course there are other instances I might cite as indicating the desire of hotel men completely to serve the public—for example, that chapel which Mr. Bowman has so happily established at the Biltmore. In short, everything that conduces to the comfort and well-being of a guest is being done to "sell" hotel service. If you can develop a specialty in your restaurant or coffee room,—as the Parker House of Boston did with its rolls, as the New York Yacht Club does with its creamed codfish, as the King Edward does with its creamed onion soup, as the Mount Royal, at Montreal, does with its souffle of lobster,—then you are "selling" special service, and the more and better specialties you have, the more attractive your service.

In a general way, the basic services provided by a hotel are the giving of food and shelter, and food here, of course, is meant to include drink, just as shelter connotes good sleeping accommodations. Naturally, where nature has set aside one-third of each 24 hours for sleeping, the hotel man gives first consideration to that factor. As to food, there are so many ramifications that it would be footless to discuss them in detail. Let us say, in a word, that both factors are well taken care of. Anything added may be called "extras," and they are myriad. Many of them have become so firmly established that though once looked upon as luxuries they are now necessities in any well conducted hotel.

Take, for one example, the telephone. The wire to the guest room is the link between the occupant and the outside world. No matter where he lives, through the hotel telephone and telegraph facilities he can be "at home." A modern hotel without a telephone in each room would simply not be—modern. We are now even getting direct radio service in guest rooms, with radiolite door knobs and push-buttons, double entrance doors for the delivery of packages without invading the privacy of the room, free bouquets and baskets of fruit.

Then there is the tendency of the modern hotel to seek locations convenient to the theater district and to the railroads. The Roosevelt, for example, is being built partly across the terminal tracks of the Grand Central, while our four million dollar Olympic Hotel in Seattle, is being built around three sides of a modern theater. Also, the hotel itself is becoming more and more a popular rendezvous. "Meet me at the fountain" has given way to "Meet me in the lobby."

But, after all, real service in a hotel is *personal* service, just as it was centuries ago. You cannot patent good manners or copyright courtesy; they are the priceless heritage of the hotel man, as possible to the small town boarding-house keeper, as to the lord of a palatial metropolitan hostelry, and you will usually find the boarding-house keeper more alert.

English inns offer a fine example of personal service. They are today as they have been for centuries. Our Mr. Rockwell, who recently returned from a motor tour of the English country districts, marveled at the perfection of personal service maintained in the ordinary wayside inn. In this country it is much more of a problem to supply intelligent hotel help of the proper type. The movement fostered by the American Hotel Association to train hotel executives at Cornell and other universities is in line with the need of developing specialists in hotel operation. But even this does not give the high class of personal service which so allures the rule-ridden American traveler in English and continental cities. A pleasant "good night" from the elevator man at one o'clock in the morning, especially if he is smart enough to be able to mention the guest's name, is service the value of which cannot be reckoned in dollars and cents, but is illustrative of the best service of all.

How can it be done? How can the principle of "personal service," so essential and desirable in a small establishment, be applied to the large hotel of 2,000 guests? Well, it can be done, and it will be done!

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END OF LOBBY
LOS ANGELES-BILTMORE HOTEL, LOS ANGELES
SCHULTZE & WEAVER, ARCHITECTS

The Architecture of the Modern Hotel

By LEONARD SCHULTZE
Schultze & Weaver, Architects, New York

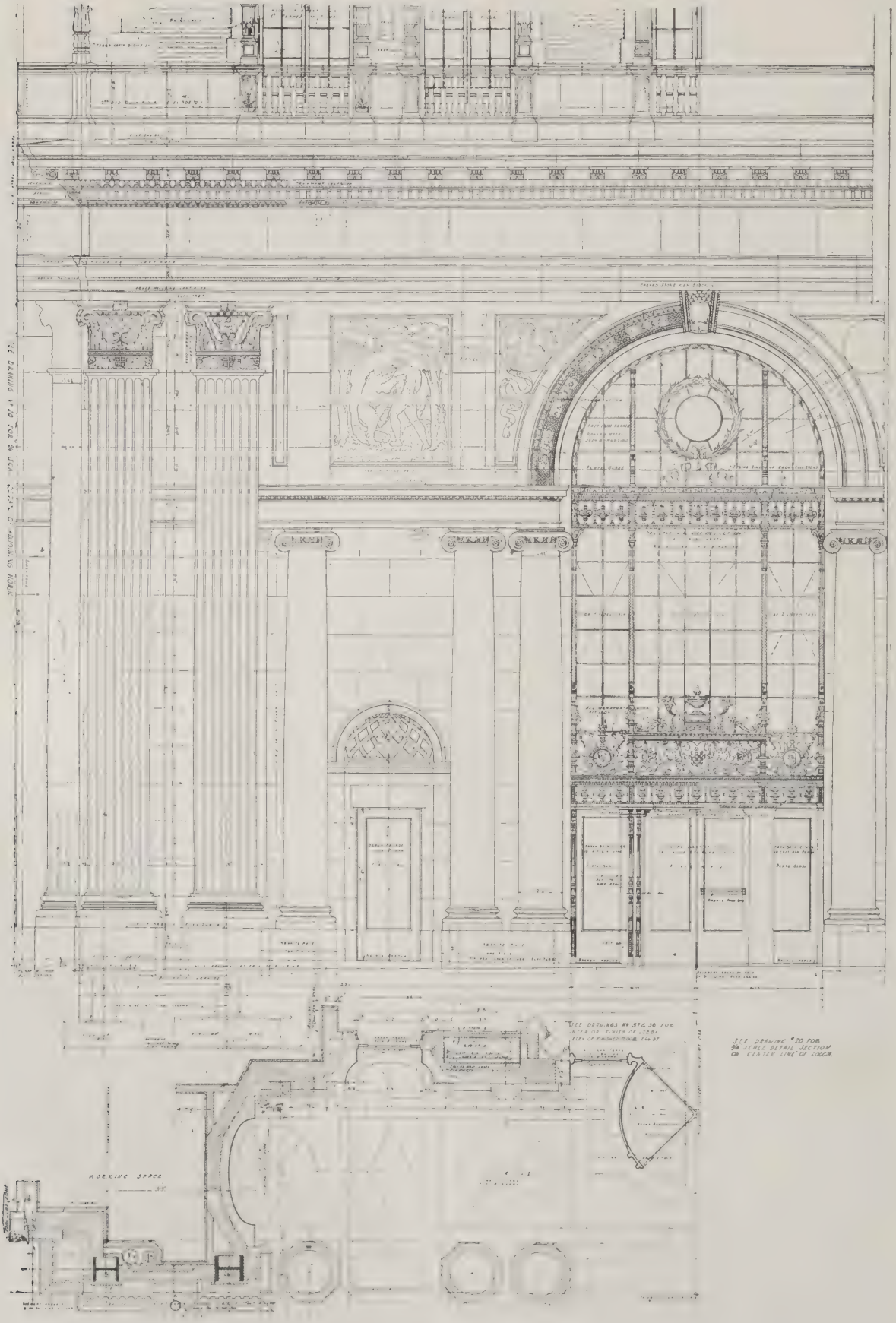
THE modern hotel from the standpoint of architectural design presents to the architect for solution the same problems that are involved in the design of any other structure of considerable size. The type of hotel having been decided upon, the building must then be so planned that it will adequately provide the necessary guest and public rooms, together with the attendant facilities that are so absolutely necessary to the successful operation of the hotel when erected.

The essential element in the planning is that of the typical guest room floor which must be so arranged, in keeping with the character of the proposed hotel, that the best type of bedroom, bathroom, etc., will be secured. Through skillful planning the bedrooms must be such that the maximum exposures to sunlight and the prevailing winds will be afforded. The location of the elevators, that they may most centrally serve the various rooms, is of importance, as are the locations of stairways, linen closets, slop sink closets and floor clerks' stations, when the latter are to be provided. These and the many other essential elements that make for successful and convenient operation must be carefully considered and provided to insure ultimate success of the operation from all angles.

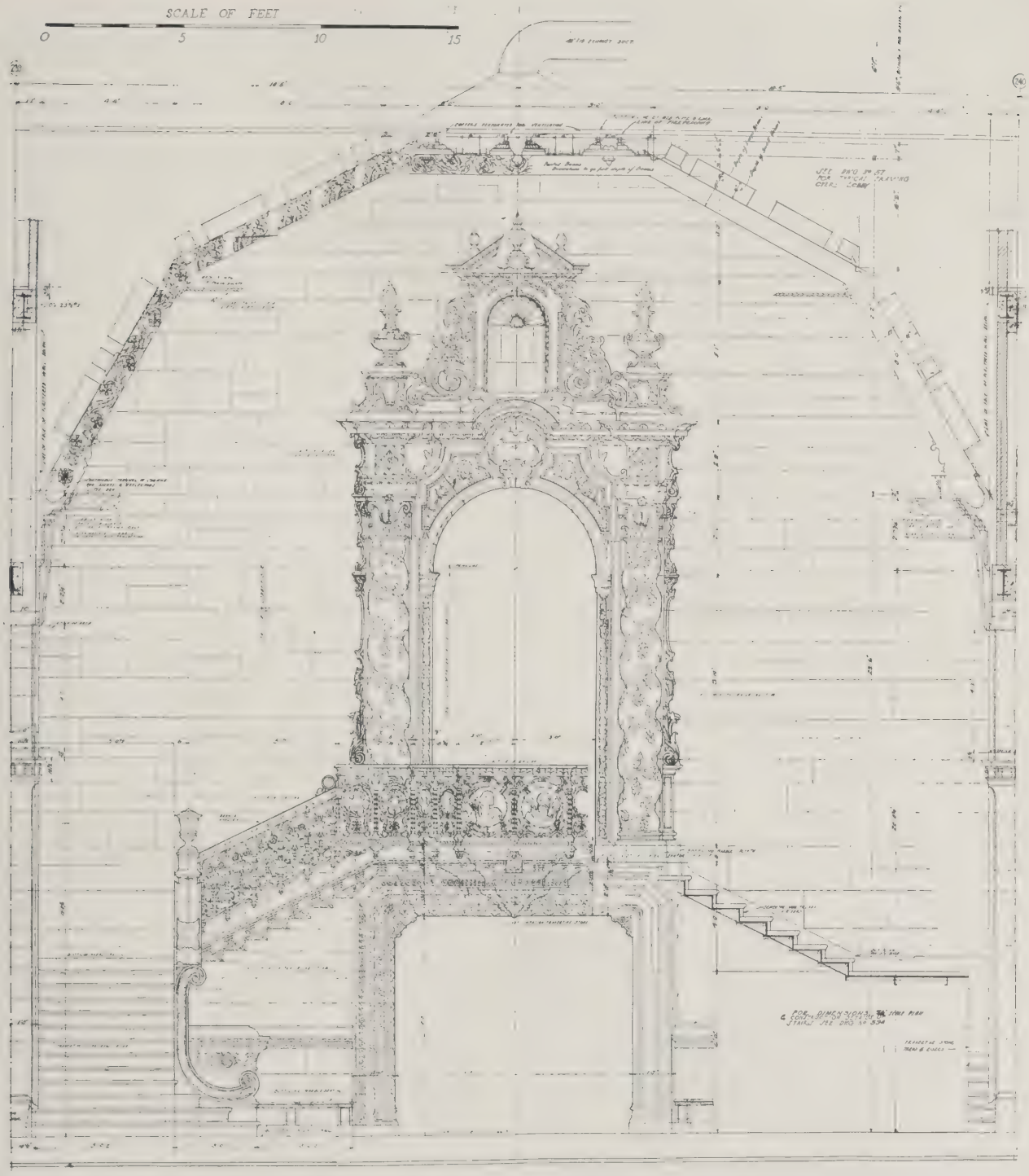
The arrangement of the offices and the public rooms, such as dining rooms, grill rooms, ball rooms and the other public features, should be such as to harmonize in layout with the plan of the typical bedroom floor and afford to the patrons the utmost in accessibility and convenience. The kitchens and service facilities, as well as the employes' locker rooms, toilets, etc., should be planned and located so as to most easily serve the various rooms they are intended to provide for. Considerable thought and attention must be given to the location of the service and power plants, the delivery entrances and the arrangement of delivery spaces to the various elements of the plan. These are of as much importance to the successful operation of a hotel as the arrangement of the guest and public rooms. It may seem that the solution of these problems as enumerated have little if anything to do with the character of the architectural design of the building; however, the successful hotel, insofar as its exterior is concerned, can be nothing more than a true expression of the various elements of the plan and the component parts of the building that go to make up that plan.

The dimensions and proportions of the lot upon which a hotel is to be erected will govern in part the

General View of Los Angeles-Biltmore Hotel, Los Angeles
Schultze & Weaver, Architects



DETAIL OF MAIN ENTRANCE
LOS ANGELES-BILTMORE HOTEL, LOS ANGELES
SCHULTZE & WEAVER, ARCHITECTS



THE scheme of the Los Angeles-Biltmore interior is built around the long gallery which extends through the entire length of the building. From it all the public rooms are reached through monumental doorways. The lobby, a detail of which is shown here, occupies the first three floors of the center wing. It is a distinctive expression of Spanish renaissance; the focal points of decoration are the marvelously elaborate staircase with richly wrought balustrade and the vigorous beamed ceiling, accented by antique lanterns of heroic size which appear to advantage in contrast with the simple travertine walls of the lower part of the room. The main dining room is arranged with two rows of large columns of porous travertine supporting a richly decorated beamed ceiling. The columns and walls are non-resonant, which produces perfect sound-deadening properties. The room is therefore free from the conversational hum so noticeable in rooms paneled in closer grained stones.

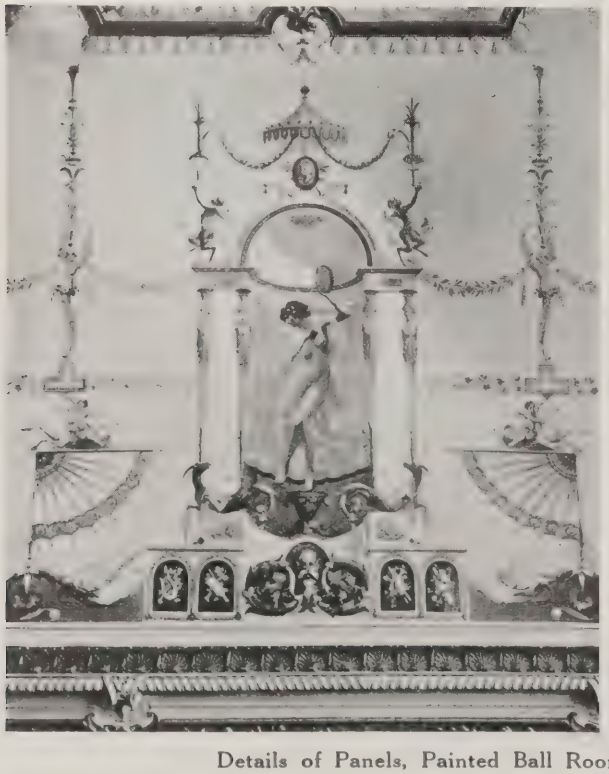
DETAIL AT END OF LOBBY
LOS ANGELES-BILTMORE HOTEL, LOS ANGELES
SCHULTZE & WEAVER, ARCHITECTS

arrangement of the rooms so that the most economical use of it may be obtained. This will affect the character of the outline of the building and determine the general mass of the structure. The climatic conditions also have their bearing on the architectural design. A hotel building for a southern city or a resort calls for an entirely different plan from that of a hotel which is to be built in a congested northern city. A hotel to be constructed in the northern portion of the country where cooler climatic conditions prevail will not require the same amount of court area as one built in a southern city or a resort.

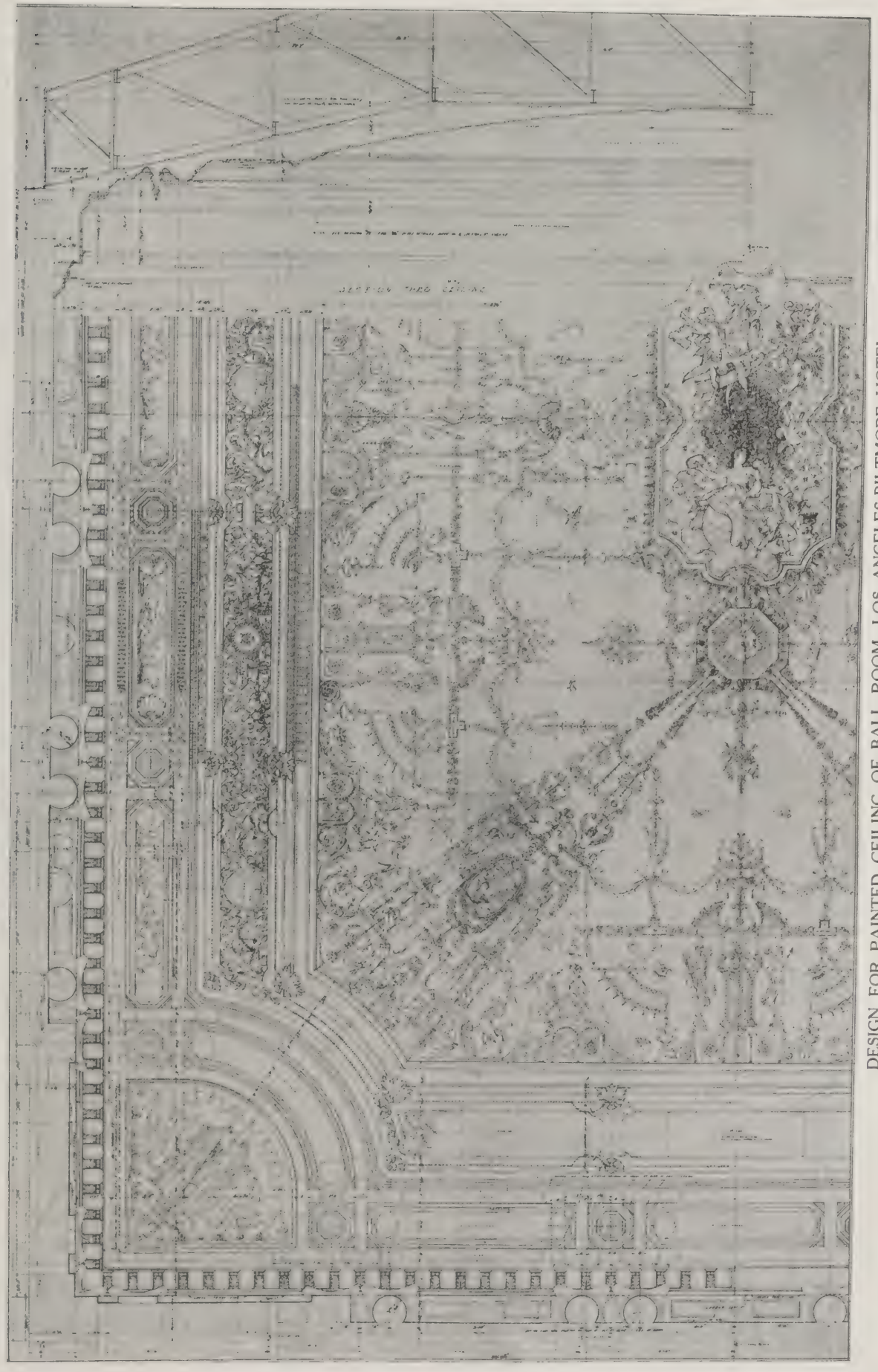
The best designed hotels in this country are those which distinctly express in their exteriors the plans of the buildings behind the outer walls. They are the hotels in which the architect has not endeavored definitely to employ a style of architecture which is not symbolical of the purposes for which the hotel is to be utilized. A hotel of a purely commercial character in a business city with its business surroundings requires that the design should partake of these elements. If, however, the hotel is in a summer or winter resort and it is to be used more or less as a social center, a freedom of treatment is permitted, which is not true of the first mentioned type.

In addition to providing in the planning for the various spaces and necessary facilities to care most adequately for the purposes for which the building is intended, the architect must always bear in mind the ultimate cost of the structure. If the appointments and decorations are too expensive and the volume of cubic contents too great, it is sure to prove a financial burden to its operators and ultimately be classed among the failures. There are numerous hotels in this country which have cost so much money that they cannot be made to bring an adequate (if any) financial return to those who invested in the ventures. There are others upon which too little money has been spent, which made necessary the omission of many of the essential parts of such a building. In consequence of this the operators are unable to give to their patrons the kind of service they have every right to expect. In the course of time competition will cause the building of other structures of a like, but better, character. These will have all of the necessary appointments provided for. The hotels without the adequate facilities will further suffer and be confronted with an extensive and expensive alteration program, out of proportion to the original cost of providing the facilities that should have been included when the hotels were built.

The various municipalities and states have adopted zoning, building and hotel laws. It is therefore virtually impossible to determine a universal type of building, either in exterior architecture or in plan, that will fit any two localities. In Boston the limit of height of a building has only recently been raised to 155 feet; in Los Angeles it is limited to 150 feet, while San Francisco places no limit. Chicago allows a maximum height of 260 feet. The zoning law of New York creates a problem entirely different from that in any of the other cities mentioned.



Details of Panels, Painted Ball Room Ceiling, Los Angeles-Biltmore Hotel
Schultze & Weaver, Architects



DESIGN FOR PAINTED CEILING OF BALL ROOM, LOS ANGELES-BILTMORE HOTEL
SCHULTZE & WEAVER, ARCHITECTS

In consequence of various restrictions as to height, some of which have been set forth together with other regulations which vary throughout the country, there is hardly any particular type or style of architecture which lends itself to a general solution of the hotel problem. The architect is governed by the conditions of the city in which the building is to be erected, and must adopt a style or period of architecture that will best fit these conditions, which can be used, however, in no more than a decorative sense to cover the bones of the structure. It is impossible to say that Italian renaissance, Gothic, Louis XVI or any other period of architecture is best adapted for any particular type of hotel. The exterior of any American steel-frame building is so vastly different from that of the buildings of the older countries where established styles of architecture prevail that no matter what particular type of architecture is employed the result will be only one of decoration.

Corner of Ball Room, Los Angeles-Biltmore Hotel, Los Angeles

The fenestration of a building should not be determined solely with the idea of securing the most pleasing appearance from the exterior. It should be so arranged that it will afford the best light and most air to the rooms that are to be taken care of. In most of the building laws of the cities of this country at present provision is made for a minimum window surface area which each room must have. This in general depends upon the number of square feet or other unit of measure contained in the room and will at times tie the hands of and restrict the architect in his selection and force him to adopt a type or size of window which may not always be to his liking.

If there are, as is frequently the case at the present time, commercial elements in the plan of the hotel building, such as shops, etc., they must be treated in a practical manner so that it will be possible for the operators to obtain sufficient financial returns in direct or greater proportion to the space set aside for such purposes. This the investors and operators have the right to expect.

The designer of a modern hotel is in exactly the same position, and has the same problems to solve, as the designer of any other commercial building. It is necessary to subordinate and at times sacrifice what the designer frequently considers his individual tastes and desires in order to provide adequately for the commercial uses and requirements of the building. He has no right to indulge his fancy in overdecoration, or in the use of more expensive materials for decoration than may be deemed essential —necessary to make the building a safe commercial investment. Hotels are planned and erected, except in a few and rare cases, with the primary idea of making money; in addition they are expected to supply the needs of the public, and at the same time afford the greatest number of conveniences possible.

Although tied down with many restrictions and with the commercial aspect always in mind, there is no reason why in designing buildings of this character great diversity of treatment cannot be obtained. No two structures need be, nor are they likely to be, the same, as seldom if ever are two plots upon which such buildings are to be erected exactly the same in size and contour. Very few hotel operators would require or wish the same type of hostelry everywhere. The problem of the commercial hotel is so different from that of the hotel devoted to social and residential patronage that the two must of necessity be treated in entirely different ways, both as to plan and design.

Roofs which are simply decorative features and serve no purpose occupy area and cost money, which could be utilized to provide additional conveniences or at times better the construction. These are as anomalous on hotel buildings as on other structures. Decoration serving no purpose is as out of place in a hotel as anywhere else. Simplicity of design is the first essential, and frequently the best effects have been obtained by the utilization of good materials and a minimum of ornament.

In the interior public rooms more latitude may be allowed. The public has come to demand that hotel rooms should be good. The taste of the traveling public has improved and has now reached the point where it knows whether the architect has used good or bad judgment. It is demanding, as far as it can, that the design and appointments of a hotel shall be as high in standard as can be obtained.

Architectural Design for Hotel Interiors

By WALTER HOPKINS
of Warren & Wetmore, Architects, New York

PERHAPS the most important, and certainly the most difficult, of all the problems facing the architect of that complex structure known as the modern hotel are the arrangement, design and decoration of what may be called the public rooms. The difficulty lies chiefly in the fact that the arrangement of the ground floor must be dictated in a very great degree by the position of the light courts, elevators, stairways and columns of the bedroom floors above.

Having determined the plan of the lower floor or floors and, in a general way, the size, form and proportions of the various rooms, the interesting and important question of their proper design and decoration presents itself. The architect of today, if his building be in or near one of the larger cities, has at his disposal an almost unlimited variety of materials from which to choose. Domestic and imported stones and marbles, tiles, faience, terra cotta and terrazzo in almost every conceivable color are to be had; and the vast field of modeled or plain plaster work may be made to play an important part. Walls, wainscoting and even ceilings of paneled woodwork in any of the many domestic or foreign woods, if properly designed and finished, may give to the smaller rooms a certain inviting warmth; cast and wrought iron and bronze, judiciously used and skillfully executed and colored, will give an attractive occasional accent; and lastly, but perhaps of greater scope than any of the other mediums, are the limitless possibilities offered in the domain of painted decoration and ornament.

With all this wealth of material at hand, the troubles of the designer begin. For it will be more than wasted effort if his rooms upon their completion do not afford a suitable environment for the particular class or type of persons who form the hotel's clientele, and perhaps of all the problems to be solved the most difficult is the intangible but fundamental problem of securing the proper degree of simplicity or of elaboration which will appeal most strongly to the majority of his public.

If the entire building has been conceived in one of the orthodox "styles" and it is the intention to have the public rooms designed and furnished in the same "period," the imagination and individuality of the designer will be held rather strongly in check,—which may or may not be an excellent thing, as the case may be. But in any event, the great value of contrast should not be lost sight of, and especially in large hotels with many public rooms does the danger of monotony become imminent. By contrast is not meant incongruity. By varying the materials used and the shapes and proportions of the rooms, schemes of the decoration, hangings and furniture, a harmonious effect can be obtained for the ensemble and yet each of the rooms be given a distinct individuality. If the grades of the streets or property permit, the interest of the entire ground floor as a whole will also be much enhanced by changes in floor levels and by the adroit use of steps and terraces.

In approaching the various rooms in the order of their importance, the lobby should perhaps be placed first. Here it is that the incoming guest receives that first impression (so important to the management) as to the likelihood of his sojourn's being pleasant or the reverse. The part the lobby plays in the life of the hotel is of course dependent entirely upon the character of the hotel itself. Broadly speaking, the lobby receives the hardest usage of all the public rooms and is the most difficult to keep in order, and therefore its floors and walls to a certain height should be of a material easily cleaned. If the appropriation will permit, a floor of Tennessee marble, as in the Hotel Belmont, has been found to be the most durable, but terrazzo in colors and hard, vitreous tile may be used effectively and at considerable reduction in cost.

The treatment of the walls will depend entirely upon the whim of the designer and the amount of money that he has to spend. Travertine wainscot with rough plaster above and a painted wooden ceiling have been used with good effect in the lobby of the Commodore, while imitation marble and a glass ceiling provide an impressive lobby at the Hotel Pennsylvania. As the lobby is in many cases placed by necessity in the center of the hotel, and therefore must depend almost entirely on artificial light, the method of lighting is most important and should be given considerable study. If the lobby is large and has a gallery on one or more sides it will be found advisable to light it without ceiling chandeliers in order that guests sitting on the balcony may not be annoyed by light from chandeliers at or below the level of their eyes. Light may be thrown on the ceiling from reflectors placed either on the walls or in high standards properly placed about the room or projected through glass ceiling lights. The last method is the less economical.

To sum up the lobby in a very general way, it would appear to be the most difficult room into which to inject any degree of charm. The office desk, the news stand, porter's desk, public telephone and telegraph offices and the gallery that is almost always necessary, all add to the difficulties of the designer, and it is only by the skillful use of materials of harmonious colors and textures that a satisfying result can be obtained.

Following the lobby in importance, and usually

The very finely proportioned main restaurant of the Ritz Carlton. Its oval form and finely studied detail make it a room of great distinction among the metropolitan hotels of New York. Warren & Wetmore, Architects

One corner of the restaurant in the Hotel Chatham, a very simple and inexpensive room, relying for its effect, upon its proportions and color scheme. The walls are a light apple green with crimson hangings. The furnishings and carefully considered lighting fixtures make it a pleasing and livable room. Warren & Wetmore, Architects

The imposing staircase leading to the ball room of the Ritz Carlton. This is a fine example of the monumental English staircases of the late eighteenth century. Warren & Wetmore, Architects

Part of the lobby of the Hotel Chatham, looking into the long gallery. The hand-modeled Tudor ceiling, the antique oak wainscoting, and the black and white marbled floors give an atmosphere domestic and livable

Warren & Wetmore, Architects

adjoining it, is the restaurant, and if the room is inherently good in form, size and proportion, its decoration should not be difficult. It is of course impossible to set forth any rule by which a hotel restaurant may be designed, and the choice of materials is limited only by the size of the appropriation. To cite a few examples of well known and successful rooms, the restaurant of the Ritz Carlton is a fine example of the architecture of the late eighteenth century in England. It is elliptical in form and of fine proportions, and its plain green plaster walls enriched with the gilded mirrors of the period, contrasting with carefully designed columns and entablatures of carved marble and richly detailed and modeled plaster ceiling, give a room of great distinction. On the other hand, the principal restaurant of the Biltmore has its walls in imported marble with pilasters; a finely designed plaster ceiling in low relief has been finished in dull old gold and subdued colors, and any feeling of coldness has been eliminated by the use of rich wine-colored hangings and by the profusion of plants and growing flowers, all resulting in a room of unusual dignity. The restaurant of the Commodore has walls of American walnut with painted and inlaid decoration surmounted by a groined, vaulted plaster ceiling elaborately modeled and enriched with color. The main restaurant of the Hotel Pennsylvania has walls of roughly finished plaster with the trim of the arched windows in decorated faience and a very fine ceiling of plaster beams beautifully decorated,—altogether an imposing room, finely designed and executed. In contrast to the rooms just described and still illustrating the range of possible materials and colors is the "Della Robbia" room in the Hotel Vanderbilt. This is a room of great charm, whose walls and columns are in tile of a fine Italian blue embellished with cream-white faience. Large panels painted and decorated in a slightly humorous vein with tropical birds, foliage, fish and flowers give a cheerful and festive air to the room. The ceiling is vaulted in blue and white tile. It is possible to continue to cite successful hotel restaurants in almost every style, material and color scheme from the most elaborate and expensive to the most simple. Delightful effects can be produced with the most inexpensive materials, and with the simplest of designs, if proper care is given to the scale of the decorative elements and the color scheme of the walls, hangings and furniture.

It is the universal custom to make the grill room a less formal room in every respect than the restaurant proper, so that persons less fastidiously attired may feel in a proper environment. The ceiling may well be much lower, and the style, materials and color scheme more free and informal. If the floor is to be carpeted, cement with a wood carpet strip around the baseboard will of course be proper, but if there is to be dancing in the grill or the carpet removed in summer, a better floor will be necessary. Wide boards of teak or oak pinned together or black terrazzo or marble mosaic with colored tile borders and inserts of brass make attractive floors, as do the vast assortment of tiles of all shapes, sizes and colors. The walls may be of any material, but perhaps wood paneling, if used with taste, may be made to give the greatest warmth, cheerfulness and informality. The ceiling, if of necessity very low, should not be decorated, and in any event should not be over-burdened with detail.

That grill rooms may advantageously be placed below the first floor and made entirely dependent on artificial light and ventilation is testified to by the success of such rooms as the grills of the Knickerbocker, Ritz Carlton, Waldorf, Vanderbilt, McAlpin and many others, but the lighting and ventilation should be given great attention and if possible made part of the decorative scheme.

If there is to be a ball room, the designer is to be congratulated, for here it is more than in any other room perhaps that he may unfetter his imagination. Again the opportunity for the attractive use of materials and color presents itself, and again the difference between the most modern of hotel ball rooms is very great. For example, the gold ball room of the Biltmore is at the top of the building, with great arched windows on three sides, while the ball room of the Commodore is directly over the lobby and is entirely without outside light, as is also the ball room of the Ritz Carlton. The ball room of the Hotel Pennsylvania is lighted from one side only, and all these are successful rooms.

The function of this room has changed greatly in the last few years, and it is now used very largely as a room in which to hold large banquets and public functions generally; but inasmuch as at times the entire floor will be used for dancing, it should be of maple carefully selected and laid. The boxes or gallery, which the management will undoubtedly insist upon having on one or more sides, should if possible be made a part of the entire design, and whatever be the scheme of decoration, it should be used only as a background or setting for the occupants of the room when it is fulfilling its intended mission.

Speaking very broadly, the public rooms of the modern hotel offer vast possibilities and interesting problems to the architect and his collaborators, and not the least of these is the intelligent use of the many allied arts and their various branches and creating a harmonious whole, within the limits of the appropriation at his command.

The restaurant of the Ambassador has its walls paneled in wood and finished in green and gold. The crimson curtains and the lighting fixtures, together with the painted flowered panels and distinctive chairs and furniture, make this a most successful room. Warren & Wetmore, Architects

The palm room, which forms the approach to the principal restaurant of the Ritz Carlton, has walls of stone and a glass ceiling through which the light is thrown. The furniture, palms and large torcheres and other embellishments give this well known room unusual character. Warren & Wetmore, Architects

The banquet room at the top of the Mount Royal Hotel is arranged for use as a summer dining room; bright hangings arranged tent-fashion above decorative poles produce an air of gaiety at moderate cost
Ross & Macdonald, Architects

The walls of the main dining room of the Mount Royal Hotel are of warm toned Hauteville marble; wrought iron grilles and lighting fixtures with the decorated ceiling combine to produce great dignity. The raised platform and architecturally framed painting at the end give a focal point of interest to the room
Ross & Macdonald, Architects

The Hotel Plan

By W. SYDNEY WAGNER

Geo. B. Post & Sons, Architects, New York

REQUIREMENTS for hotels vary greatly with the cities in which they are located and the type of service they aim to render. The largest single group is the commercial hotel, and the elements of a first class building of this type of 500 and more guest rooms' capacity are becoming fairly standard. In developing the general discussion of hotel planning in these pages this class of hotel has therefore been kept in mind.

The conditions to be met in creating hotel service are essentially uniform and may be simply stated. The great majority of guests are travelers "on business"; the average city in which the hotel is located is itself devoted principally to business, and its social requirements are simpler than those of a cosmopolitan city like New York; the number of guests likely to use a hotel as a place of permanent or seasonal residence is small, and there is a lack of good restaurants. Most of these cities aim to attract the numerous trade conventions, club and fraternal gatherings which fill the rooms and lobbies of the hotel to overflowing for a week at scattered intervals, leaving it abruptly to resume a normal existence.

Given these requirements, the hotel must, above all else, be a place where the traveler can obtain shelter and rest; where if he be a merchant or salesman he can display his wares and transact his business with comfort. It must next supply his various wants in dining room and sleeping room service; and if it would avoid being relegated to the ranks of the justly despised "second rate" commercial hotels, it must supply this service in such manner that the guest upon leaving will look forward with pleasure to his next visit. It must endeavor to be both for the residents of the city and for the out-of-town guests the center of the social activities of the town. It should be capable of handling the peak load occasioned by the arrival and stay of a large convention without disturbing the comfort of the other guests. Its service, morale and appointments and the atmosphere of its public lobbies and dining rooms, should be such as will neither offend nor repel the woman guest, nor yet overawe the commercial traveler.

In particular, the commercial hotel will require a great percentage of single rooms and will also require that even where suites of two, three or four rooms are provided, each one of these rooms will be equipped with a bathroom and be so planned that they can be rented either by the suite or as separate rooms. Naturally, the corners and ends of wings are the most desirable locations for these suites. The lobby in a commercial hotel should be of such size as will provide ample lounge and seating space for commercial travelers, who very often spend much time in this room waiting for appointments and frequently use it for the transaction of business. In a strictly commercial hotel it is a mistake to provide too much formal dining room space. The necessary amount of space should be carefully apportioned between the main dining room and such other dining facilities as the men's grill or cafe and the lunch room or cafeteria. While in a commercial hotel it is not always desirable to compete with other agencies for large social functions, yet the building should have sufficient banquet room and convention facilities to attract to it the various business conventions and the luncheons of business associations.

A second type rapidly coming into favor is the residential hotel. This is practically an apartment house with hotel service. Its planning more nearly approaches that of an apartment house, and it will be considered here only to the extent of pointing out the main differences from the commercial hotel. The rooms should be arranged in suites; they should be larger in size than those in a commercial hotel and should be provided with ample closet space. This last is very important. The dining room provisions in a residential hotel are simple. They are generally restricted to one main dining room, a tea room and possibly several private dining rooms for the use of the residents, and a small banquet and ball room to take care of moderate-sized social functions. The lobby can be reduced to such size as will serve only the needs of a reception and waiting room.

General Plan Requirements. The beginning of any hotel planning problem is in the study of the lot that has been selected. Points affecting the choice of a site are definite and are discussed elsewhere in this issue. Assuming that a suitable site has been chosen, the first determination is the relative worth and importance of the surrounding streets and their relation to the automobile thoroughfares and accessibility to the one or more railroad terminals in the town.

It is desirable when grade conditions permit and the surroundings and traffic are not detriments, to arrange the entrance on the highest street. This permits the service being taken on a lower floor and also permits of all the public rooms surrounding the main lobby obtaining natural light.

A rectangular lot will permit of the most compact development of plan, and it will necessarily follow that a hotel planned on a lot of this type will be more economical to operate. While it is not impossible to plan a building on an irregularly shaped lot, the units of the plan are more or less scattered

necessarily, and the problem of co-ordination is extremely difficult to solve. It is usually more desirable to secure a lot of rectangular shape even with some sacrifice of location and it should further have such area that a hotel can be planned to go to the limit of building height, if there is such a limit in the city.

It is considered the best practice to eliminate whenever possible interior courts, and in addition to plan the building so that all of the courts will be assured permanent light. The open court makes practically every room an outside room—an item of importance to the owner, and with care in orientation, a very large portion of the rooms can be assured direct sunlight and the benefit of prevailing winds.

In any plot of ground it is desirable at the outset to give consideration to the future growth of the hotel to meet increased demands. There are two ways of making provision for this: the first is to so plan the building and the structural steel as to permit of the addition of extra stories on top of the original building; the other is to plan for only a portion of the property, reserving the remainder of the lot for future additions. The last mentioned method will in most cases be found the most desirable, as the future additions can be erected with the least disturbance to the original building. The extension of service quarters should not be overlooked; in the first method the full equipment or space reservations for it would need to be made in the original building; the second method is more elastic in that additional quarters can be incorporated in the new construction when the exact nature of the demands are known.

Where there is no question as to the necessity of increased capacity in the almost immediate future, the building structure necessary to provide additional guest rooms can be erected as part of the primary building operation and the extra space devoted, until such time as it is really needed, to office building or similar purposes. In the Statler Hotel, Buffalo, the two upper floors of the building are now in use as offices and are so planned that they can readily be converted into guest rooms by the extension of plumbing and steam lines and the installation of bathrooms. The Wilmington Hotel, in Wilmington, Delaware, has been built in two sections, one of which is now used as an office building; the office corridors are continuations of the hotel corridors and the floor levels the same, so that as the hotel requires additional space a floor of the office building portion may be taken over. In the Hotel Texas, Fort Worth, some of the typical floors are rented as hotel apartments. Only one bathroom to a suite is completed; space for the number necessary for single room occupancy is provided, however, and for the present use serves as commodious closets.

Economic Considerations of Plan. The hotel plan presents a problem of great complexity from the economic viewpoint. The non-revenue producing area should be held at all times to the minimum consistent with good service. In general the public and service space should in no case exceed 45 per cent of the cubic contents of the building. In the commercial hotel in small cities every effort should be made to keep this percentage to 25 or 30 per cent of the total cubic contents.

After a study of many hotel plans it is apparent that it has been the usual practice in planning the typical floor, after the general arrangement of the elevators, corridors, and wings had been determined, to devote exhaustive study to the location of the structural steel columns and then, struggling under great difficulties, to adjust and fit the bedrooms and bathrooms around the steel columns. In planning hotels this process should be reversed. The rooms and bathrooms should be planned in standardized units to conform to requirements of service, and the spacing of the structural steel columns and floor beams then devised to become part and servant of this standard arrangement. This may involve the use of a few additional tons of steel, but greatly offsetting this, a standardized unit, comprising not only the bedrooms and bathrooms, but also the very structure of the building itself, is obtained. Great simplification in the details of this unit is then possible. The economy effected by the elimination of the many odd corners and patches of furring, which are an inevitable consequence of the old method of column dodging, will alone more than balance the cost of the extra weight of steel. More rooms per floor can be secured through the saving of space and the greater compactness of the unit.

The proportionate sizes of the main dining room, breakfast room, cafeteria and grill room must be determined by a study of the local conditions. The same applies to the ball room, banquet room and private dining rooms. Some provision for rooms of this character is usually desirable to a greater or less extent in any hotel—in some cases for entertainment facilities and in other cases to attract conventions. When a roof garden is desired for use as a summer dining room, it is more economical to have it of such type that it can be used during the winter season as a ball room and convention hall. This assures practically a 12 months' operation of this room as against 6 months' operation for two separate rooms.

The most recent development in hotel planning has been the effort to introduce store rental space on the ground floor. While at one time it was generally claimed by hotel operators that stores could be incorporated only to the detriment of the hotel plan, this frame of mind was induced largely by the fact that a ground floor lobby was considered an essential feature in every hotel. It has been proved that a lobby raised above the street level sufficiently to permit of the installation of stores at grade has not been a detriment. This is illustrated in many of the large hotels erected in

recent years. In any event, the lower floor of a hotel should be planned to permit of the easy and economical alteration of the ground floor into store space. Under existing conditions it is important that no large areas on street frontages be placed a half-story or less below grade, because of the difficulty such a scheme presents in alterations.

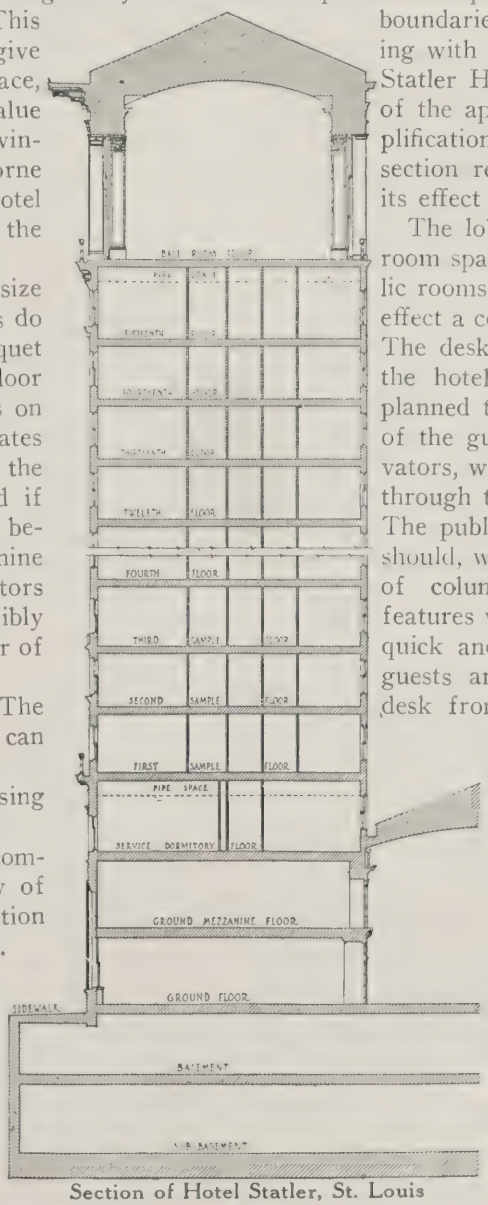
Where the area of the property permits, it is very often possible to plan an interior lobby a half-story above the street and the public rooms surrounding this lobby one full story above the street. This will permit having stores below the public rooms at street grade. A plan of this type affords great possibilities in decorative treatment owing to the attractiveness of the various levels between entrance, vestibule, lobby and surrounding public rooms.

When the lobby is placed above the street, it is desirable to plan an arcade from the street level to the passenger elevators to provide elevator service to elderly and infirm people who might object to climbing the stairs to the lobby. This arcade can be planned so as to give access to the rear of the store space, which greatly enhances the store value and provides additional show window space. It should always be borne in mind that the population of a hotel itself usually adds materially to the value of the stores.

It is also desirable, when the size of the property or other conditions do not permit of the ball room or banquet hall being located on the same floor as the lobby, to locate these rooms on the mezzanine floor, as this facilitates service from the main kitchen to the ball room and banquet room, and if adequate stairways are arranged between the main lobby and mezzanine it will relieve the passenger elevators of a great deal of traffic, and possibly permit of a reduction in the number of passenger elevators.

Detailed Plan Requirements. The essential parts of a hotel building can be grouped under five heads:

1. The typical floors, comprising the guest bedrooms and parlors.
2. The sample room floors, comprising the rooms for the display of samples and for the accommodation of the merchants displaying them.
3. The public floors, comprising the public lobbies, dining rooms and other rooms devoted to the general use of the public.
4. The function floor, comprising the ball rooms and banquet rooms of various kinds.
5. The service parts, comprising the kitchen, mechanical departments, and, in short, all of the innumerable units necessary to supply the service to the other four parts, and to provide accommodations and service for the employes.



Section of Hotel Statler, St. Louis

In practically every hotel the plan of the typical guest room floor should be the controlling element, as after all the sale of rooms is the greatest source of revenue, and no sacrifice of it should be made to obtain effects on public floors. Next in order of importance is the ground floor, and in a hotel with social activities, the entertainment floor would logically follow in degree of importance.

It is, of course, obvious that all of these floors and also the various service floors are very closely related, and that the entire plan of the building must be considered as a unit. It is essential to keep constantly in mind the necessity for simplification. Each section of a hotel is planned to deliver a certain type of service to the guest. This requires that each department be planned as a complete unit with boundaries well defined and not merging with those of any other part. The Statler Hotel, St. Louis, is an example of the application of this idea of simplification, and an examination of the section reproduced herewith will show its effect on the layout of the building.

The lobby is the heart of the public room space, and the various other public rooms should be carefully studied to effect a convenient arrangement with it. The desk must be in plain sight from the hotel entrance and should be so planned that there is a direct progress of the guest from the desk to the elevators, without the necessity of crossing through the lounge space of the lobby. The public space in front of the desk should, whenever possible, be kept clear of columns and other architectural features which might interfere with the quick and comfortable registry of the guests and with the visibility of the desk from the entrance and elevators. Ample space should also be allowed in front of the dining room entrance and of the passenger elevators so that there is no crowding at any one of these points.

The main office desk should be so planned that the portion nearest the main entrance contains the registry and information wickets and the house telephones. At one side of these units should be located the space containing the mail and key racks, and at the opposite end of the desk there

should be located the cashier's desk and bookkeeping departments. Immediately behind the desk and screened from the public, such working quarters as are required for mail sorting, credit department and assistant manager's office should be arranged. It is desirable, but not necessary, to have the administration offices in direct communication with the main office desk, either directly back of it or on a mezzanine floor directly above it and accessible by means of private stairways.

It is the practice in the larger modern hotels to provide each floor with a room clerk's desk at which the guest obtains his mail and keys. This necessarily alters the layout of the main office desk and permits of a reduction in the amount of space devoted to the mail and key racks. In any hotel having a capacity of more than 700 rooms it is desirable to provide floor clerk service.

Provision should be made at the front office desk for safety deposit boxes and larger boxes to receive sample cases of jewelry salesmen, etc. These are usually under the control of the cashier's department or the assistant manager's department.

At some point at or near the main office desk there should be provided a table for the captain of the bell boys, equipped with electrical duplicating writing machines through which messages are sent to the captain and in turn transmitted by him to the bell boys. The porter's desk is usually located near the elevators and should have direct access to the service elevator hall. In connection with it there should be a waiting space for porters.

While in most cases it has been found desirable to group the elevators, main desk and lobby lounge space in one large room, it is often desirable to provide a working lobby containing the desk, elevators, check room, porter's desk, etc., and a separate lobby lounge. If this is done, however, the lobby lounge should be so planned that guests using it have as full a view as possible of the activities in the working lobby, as it has been found that a lobby lounge isolated from the active main floor of the lobby is not popular.

The main lobby may be so planned that that portion of it adjacent to the main dining room can be furnished and used as a combination palm room, tea room and lounge. The main lines of circulation through the lobby should be planned so that they do not interfere with each other and do not cross the lounge portion.

In a modern hotel of 600 rooms or over, public taste apparently prefers a two-story lobby. In houses of smaller capacity large space cannot be profitably devoted to the public rooms, and with good designing a lobby of one story can be made very attractive. The clear ceiling height of such a room should range from 15 to 18 feet. In a two-story lobby it is desirable to have the mezzanine floor between 12½ to 13½ feet above the main lobby floor level; this provides ample ceiling height for the stores and other rooms located under the mezzanine floor and yet keeps the mezzanine lounge level within comfortable visual distance of the main lobby floor.

It is always desirable to group the passenger and service elevators together, and they should have as central a location as possible. The combination provides better service to the guest, through being more convenient for the employes. It brings all of the overhead traction elevator machinery under one roof and one control. On the ground floor it facilitates the service of the correlated departments of the front office, porter and bell captain.

Passenger elevators particularly should always be planned in one bank rather than in two or more isolated banks, as otherwise the service will be very uneven. In large hotels it is more desirable to locate the elevators in two banks on either side of one elevator lobby rather than one long run. An arrangement of this kind would be considered as being in one bank, since they are all located about one lobby and all clearly visible to the guest.

It is desirable to provide the elevator lobby of the typical floors with swinging doors to act as a noise buffer between the elevator lobby and guest room corridor. In any event, however, every effort should be made to avoid the location of elevator shafts adjacent to a guest room partition.

Provision of some kind should be made for the conveyance of automobiles and other large articles from the street to the main ball room by means of a large lift or large driveways to the street; this is essential for the proper handling of exhibitions now frequently held in hotel ball rooms.

The Guest Room Unit. Since supplying rooms constitutes a major portion of the hotel's service to guests, it is obvious that a preponderance of study should be given to the plan of the typical guest room floor. The average size room used in modern hotels is approximately 10 to 12 feet in width by 16 to 17 feet in depth. The majority of rooms should be of this size, and there should be a certain percentage of smaller rooms, ranging down to 10 x 12 and the larger rooms to a maximum of about 15 x 18, with a small percentage of parlors averaging about 16 x 20 feet. A clear ceiling height of about 9 feet, 2 inches is standard, but in some instances this has been successfully decreased to 8 feet, 8 inches. Where possible, a flat ceiling is desirable.

While it is always desirable to obtain the maximum capacity of rooms to a floor, this should not be done at a sacrifice of room size and room light. It is almost as economical, if better rooms and lighting can be obtained, to plan fewer rooms to a floor and obtain the desired number of rooms by the addition of an extra story or two. Every room should be so planned as to permit of a proper furniture layout, and it is always desirable to show the location of the important pieces of furniture on the floor plans in order that lighting outlets can be properly located.

In the modern hotel there is no question about the

importance of baths—every room, including the typical floor parlors, should have a private bath. Even where a hotel is planned and the cost does not permit every room being provided with a bath, some provision should be made in the plan for the future installation of baths.

There has always been much discussion of the relative merits of the inside and the outside bathroom. In operation it has been clearly demonstrated that in the commercial type of hotel the well ventilated inside bathroom is far superior to the outside. In the ventilation of the former the air is always passing from the bedroom by means of a small space left between the bottom of the bathroom door and its saddle, through the bathroom and into the ventilation shaft by means of a register opening in the bathroom wall. This current of air can always be maintained positive, whereas in an outside bathroom pressure of air from an open window therein will often reverse this current and force the bathroom odors into the bedroom. The parlor suites may be provided with outside baths to meet the occasional demand for this type.

The detailed planning of the guest room unit is susceptible of a number of variations. A number of schemes are indicated by the accompanying plans. The preponderance of favor today is for the double bathroom unit placed on the corridor end of the rooms as shown in Fig. 1. The small vestibule between the corridor and the bedroom, created by this arrangement, is valuable as a transitional entrance to the room, acting as a buffer between the guest and the noises and light of the public corridor at night. In it can be placed the doors to the bath room and the clothes closet, thus screening the entrance to the bathroom from the bedroom, and giving more wall space and the possibilities of better furniture arrangement in the bedroom. By its use the greatest number of rooms per floor can be obtained, always an essential requirement where the height of the building and the area of the property are both limited. Any desired number of these bedrooms can be arranged en suite, but the tendency today is to limit inter-communication between rooms to the corner suites and a few tiers of rooms in the center of the building, so that this advantage is not of great importance. The use of this scheme results in a wider building wing, always more economical in construction because a minimum amount of exterior wall per bedroom is thus secured, and because, in a high building, less steel for wind bracing is required, owing to the wing's greater stability.

Bath rooms are preferably divided into two types —tub baths for the higher priced street rooms, and shower baths for the lower priced court rooms. In planning, each of these types should be standardized into a typical unit, consisting of two bath rooms with a common vent and pipe shaft between them. This shaft must always be at least two feet wide and should contain all of the main lines of hot and cold water supply, drainage, steam, ice water, and other piping. It serves also as the bathroom ventilation shaft, being connected with a common plenum space under the roof.

The bath room fixtures can be so placed along the wall of this shaft that instant access may be obtained to their several systems of branch piping by means of a hinged medicine cabinet and mirror frame located above the wash basin and opening into the shaft. Architects should never lose sight of the fact that all plumbing and steam lines will sooner or later require replacement, and they should therefore be placed in shafts that will permit of replacement with the least possible damage to partitions and general disturbance to the guests of the house.

It is always economical to have corridors so planned that they serve bedrooms on either side. Main corridors are usually 7 feet, 6 inches in width and secondary corridors 6 feet in width. They are usually provided with marble, glass or terrazzo wall bases and floor borders, and should always be planned to receive standard widths of carpets between the inside edges of the floor border. For secondary corridors a 4 feet, 6 inches width of carpet is used, and for main corridors a 6-foot width. If a corridor is planned so as to require a width of carpet over 6 feet it adds greatly to the cost of carpet, as this additional width must be obtained through sewing on borders. There is no loom that will weave commercially carpets over 6 feet in width. Likewise, if possible, bedrooms should be planned in multiples of the standard carpet width—2 feet, 3 inches.

Large closets are desirable, and a room should be provided with one whenever possible. It is essen-

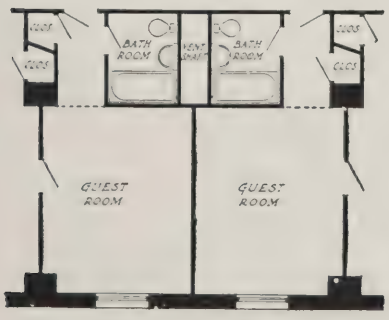


Fig. 1. Double Bath Room Unit between rooms and corridor

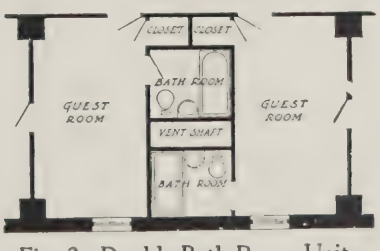


Fig. 2. Double Bath Room Unit between guest rooms

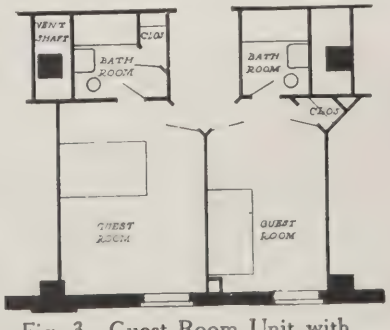


Fig. 3. Guest Room Unit with common lobby to save space

tial that a room planned for double occupancy have ample closet space. In some of the smaller rooms the closets may be omitted and wardrobes substituted. A closet should never be less than 22 inches in depth—large enough to take a coat hanger. For the average room in a commercial hotel, where used chiefly by traveling commercial men, a closet of 22 inches in depth by 3 feet in length provides ample facilities.

A modern device that is proving valuable in speeding up and extending service to guests in their rooms is the room door with a double-doored compartment opening to both room and corridor. Its detailed construction permits the servant's access to the compartment from the corridor without entering or seeing into the room. In appearance the arrangement resembles a single-panel door with the panel a convex surface on each side to provide the necessary compartment depth.

Every typical guest room or sample room floor should be provided with linen, storage, maid and slop sink closets—one or more of each, depending upon the size of the plan. The linen closet or maid's room should provide space for keeping the linen and supply wagon now in common use in the larger hotels. To complete the typical floor layout consideration must be given to the amount of room food service required. In first class New York hotels of the type of the Biltmore and Pennsylvania pantries to provide this service are located on alternate floors. In a hotel of the more purely commercial character, where the demand for this service is less, it is practical and desirable to omit the floor pantries and have all service come direct to the rooms from the room service pantry adjacent to the main kitchen. An ample service hall should be provided on every floor, and it should be especially large where it is expected that there will be a considerable amount of room service. When floor pantries are incorporated it is the usual practice to provide dumbwaiter service to them from the kitchen, although some hotel managers prefer that the connection be made by means of service elevators which permit the handling of food in larger quantities and the use of heated wagons.

The number and locations of stairways in hotels are usually governed by local building ordinances. They are very seldom used by the guests, and are provided almost entirely for fire exit purposes. There should, however, be a service stairway in connection with the service elevator hall to relieve the use of the service elevators for inter-floor traffic by employes.

Sample Room Floors. In the usual commercial hotel a certain number of rooms must be arranged particularly to meet the needs of salesmen who want display space for merchandise. Salesmen's samples are usually packed in large trunks, and the rooms are therefore located with special reference to their accessibility from the freight elevators. These rooms also serve as sleeping rooms for the merchants, and this function occasionally justifies their being grouped as a part of the typical guest room floor. It is better practice today, however, to arrange them apart from guest rooms on one special floor or more as requirements dictate, and preferably on the lower bedroom floors immediately above the public rooms or the service dormitory floor. The advantages of this arrangement are many. The corridors, rooms, walls, doors and door frames can be designed to withstand the rough usage incident to the handling of the sample trunks; the freight elevator service necessary in this handling is reduced in run, and consequently is capable of better service; persons calling to inspect the display of samples do not feel that they are intruding upon a sleeping-room floor; it permits of architectural expression on the exterior through the use of larger windows, and consequently provides better light for these rooms. It facilitates the service of the room clerk in the front office, because it differentiates most distinctly on his room rack the sample rooms from the guest rooms, and prevents confusion.

The sample room must provide a dual service. Primarily it must be suitable for the display, to their greatest advantage, of the various kinds of merchandise and samples. Secondarily, as the merchant, for reasons of economy and surveillance, usually demands sleeping and living accommodations in the same room with his display, it must provide these without interfering with the display, inspection or sale of the merchandise. In the Hotel Statler, St. Louis, is a very good expression of the sample room. In these rooms the beds, when not in use, fold back—"disappear"—into a ventilated closet, and the dresser and the entrance to the bathroom are located in an alcove. This arrangement leaves the room proper clear of all furniture other than that required for sample display purposes, provides the maximum amount of wall space, and removes from sight all suggestion of a sleeping room, which might be objectionable to visitors calling to inspect the display. The radiators are low to permit of sample tables being placed over them; the room door openings are of extra width to allow the passage of the big sample trunks, and the jambs are of steel to withstand the wear and tear incident to their passage. The lighting fixtures and receptacles are designed and located to give the best lighting to the greatest variety of merchandise.

Kitchen and Service Requirements. A multiplicity of kitchens should be avoided, as the apparent necessity for them is usually due to improper planning. It is generally desirable to plan the main kitchen and the secondary service kitchens or banquet pantries so that all of the food is prepared in bulk in the main kitchen and only kept warm and served in the secondary kitchens. In connection with the main kitchen there should be a room service pantry from which all of the food service to guest rooms is handled. Generally this room service pantry should be located so as to be accessible both

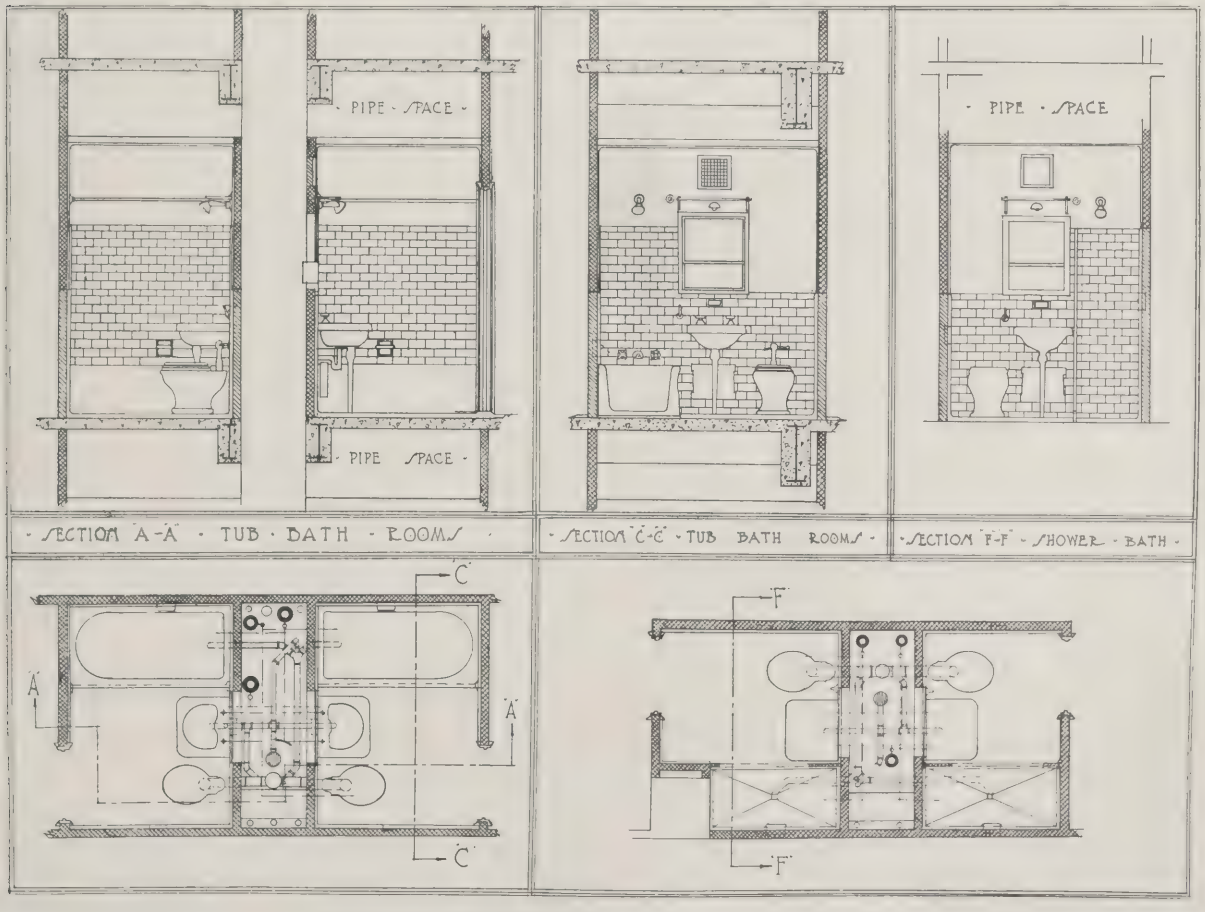
to the main kitchen and to the service hall and elevators. This will provide efficiency of service.

In the planning of the Statler hotels, one requirement that is insisted upon whenever possible is that the main kitchen must be located on the same floor level as the principal dining room. To this principle has often been sacrificed the possibility of securing much valuable outside rental space on the ground floor in the form of stores and shops—rental space which in the majority of instances is in other hotel plans the governing factor that controls the architect in the arrangement of the public floor and in the relations of kitchen and dining rooms. Good restaurant service demands ready accessibility to the kitchen, and if this is not assured the return from store rentals will not repay the damage suffered by the hotel. When possible it is better to have the kitchen located so that it can obtain natural light, but in many cases natural light is too important for the public rooms to devote it to the kitchen, and it is then feasible to place the kitchen in the basement.

In some hotels the kitchens have been located on a floor above the dining room, making it necessary for the waiters to serve downstairs. Now, if there is one thing more difficult and trying than to carry a loaded tray *upstairs,* it is to carry one *down*—one trial will convince anyone. Yet many hotels are designed (but by no means operated) in blissful ignorance of this fact. Unusual importance should be attached to the dining room service when the kitchen is on another level. The serving pantry adjacent to the dining room must be equipped with refrigerators, warmers, silver and plate racks, and service counter; with an endless chain dish conveyer to carry all soiled dishes to the dish-washing department below; with a linen chute to carry the soiled linen to the laundry; with a double stairway designed to prevent the crossing or congestion of waiter traffic; and in the arrangement of the kitchen below, everything required by the waiter should be in relative proximity to the service stairway.

With proper methods of forced ventilation it is not essential that a kitchen have natural ventilation, and in fact most ventilating engineers have an objection to a kitchen with natural ventilation, since an open window would short-circuit the ventilating system and carry the various kitchen odors into other portions of the house.

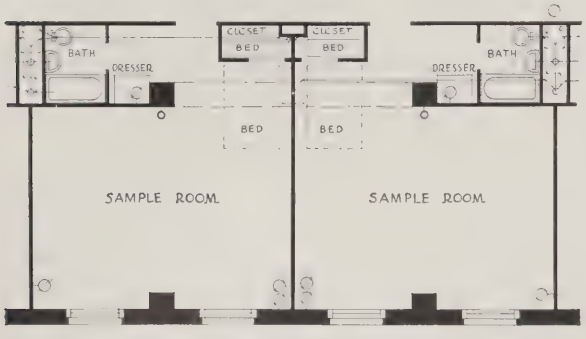
The service entrance should be located as far as possible from the public entrance to the hotel and on the least desirable street frontage. Where possible, it is desirable that this entrance be located under the building and reached by means of a recessed driveway in order to avoid congestion of sidewalks by baggage and food supplies, and also to



Details of Standard Tub and Shower Bath Rooms
Geo. B. Post & Sons, Architects

prevent the noise of handling baggage from reaching the guest room floors to the annoyance of guests.

This service entrance should open upon a wide service corridor serving the various store rooms, trunk rooms, etc., and should have direct access to the service elevator hall. It is found desirable to locate the service lifts for handling baggage, ashes, supplies, etc., at this service entrance in order to concentrate control of the employes. An entrance for employes separate from the service entrance should be so planned that all the help sleeping out of the building must pass by the timekeeper's office, and it should be within easy access of the various help's locker rooms and toilets.



Sample Room Plan, Hotel Statler, St. Louis
Geo. B. Post & Sons, Architects

The question of "sleeping" help out of the building or in the building should be determined by local conditions and the character of the help. Hotel operators are endeavoring wherever possible to reduce the number of sleeping quarters for employes to the minimum, owing to high construction costs. When a dormitory floor is provided for female help, the rooms for the housekeeper and her assistants should be so located on this floor as to enable them to supervise the help. On this same floor should be located the main linen room, which should be under the control of the housekeeper and adjacent to her living quarters.

If a considerable number of employes' sleeping rooms are to be provided, this circumstance can be utilized to plan a combined service and dormitory floor directly over the floors containing the public rooms and below the main shfat of the building formed by the sample room and typical floors. The advantages of such a location over that usual, at the top of the building, are many and, after discovery, obvious. It acts as a "buffer" floor between the two parts of the house. It serves the double purpose of dormitory and pipe space, as under its ceiling may be located the various large trunk lines of plumbing, drainage, steam, and vacuum piping, ventilation ducts, and electric wiring, otherwise requiring a deep pipe space above the ceilings of the public rooms. The service floor arrangement permits of the more economical installation and repair of these lines; the danger of leakage and consequent damage to the costly decorations below is minimized, as not only will the waterproof cement floor of the dormitories hold the water longer, but the fact that this floor is constantly occupied will ensure instant detection, alarm and quick repair.

Whenever possible, the laundry should be located in the basement so that the heavy machines can be placed on independent foundations. If the laundry is located on one of the upper floors of steel construction, the noises from the machinery are very apt to be carried to the guest room floors through the structural frame of the building. Where possible, there should be a conveyer from the main laundry to the linen room in order to relieve the service elevators of this traffic. There should be a linen chute from a maids' closet or from the service hall on each guest room floor to the linen sorting room adjacent to the main laundry. There should also be a rubbish chute with openings from each guest room floor to a rubbish sorting room in the basement. Many hotels provide a room in connection with this rubbish room called a "baling room."

Considering special features of the plan that might come under the head of "concessions," it is interesting to note that several modern hotels have found it desirable to provide dressing rooms and bathrooms for the use of guests while waiting assignment to their rooms, and for the use of dinner guests who require dressing rooms and baths, but not sleeping accommodations. In several hotels these accommodations have been provided in connection with the valet departments. Many hotels have found the complete Turkish bath unit to be a profitable installation. It is usually located in the basement, due to the difficulty and cost of carrying the swimming pool on any of the upper floors. A "beauty parlor" is also one of the requirements of the modern hotel. This is usually located on the mezzanine gallery of the main lobby and adjacent to that portion of the gallery devoted to women's retiring rooms. In general, service and entertainment features for men are located in the basement, and those for women on the mezzanine. A library on the mezzanine has also been found to be appreciated by guests.

In order to secure a proper mechanical and structural layout, it is essential that the mechanical and structural engineers work with the architects on the plans almost from the inception of the project. As the plan of a modern hotel is of such a complicated nature, it is essential that an architect who has had no previous experience in hotel planning should obtain the services of a hotel consultant and a hotel manager who is capable of reading plans.

The essence of the hotel plan is, after all, its usefulness as a service machine in providing for the comfort of the guest, and therefore any preconceived ideas of architectural design should be closely related to that idea. Too much stress cannot be laid upon the vital importance of planning and equipment, and upon the fact that the architectural treatment of the building should be secondary.

Economics of the Hotel Project

By DANIEL P. RITCHEY

Consultant in Hotel Planning and Operation

This article is a sequel to "Practical Points in Hotel Planning," written by the same author for THE ARCHITECTURAL FORUM of December, 1921. After this article was presented, architects and owners submitted to the FORUM Service Department and its regular Consultation Committee, of which Mr. Ritchey is a member on hotels, plans for new hotel projects aggregating over $40,000,000 in construction cost. A careful analysis with constructive criticism was made for each project submitted. In the article herewith presented an effort has been made to avoid covering points discussed in the first article.—THE EDITOR.

THE first practical business consideration relative to a new hotel project is the preliminary analysis of community hotel requirements in order to measure local interest and support and to determine the requisite size and type of hotel, together with the most logical site. Certain phases of this question have already been covered in other articles in this issue, but there are a few points which are worthy of special consideration. In smaller cities or towns the moral support and recognition of civic organizations such as chambers of commerce is considered of more importance than direct financial support. The actual financing of the project, if any part of it is to be undertaken through civic interest, should be developed through a small group of leading citizens, such as bankers and local merchants rather than directly through civic organizations, in order to facilitate the handling of the actual business transactions involved; otherwise, a complex condition arises, involving many personal interests and thus making the project more difficult to handle in a businesslike and politic manner.

In selecting a site for a hotel to be located in a smaller city or town, the primary considerations are convenience of transportation, the possibilities presented by main arteries of motor travel and the physical characteristics of the land in question. In the last few years the various types of hotel guests have become educated to demanding better service and different surroundings, so that in locating new hotels there is an inclination to get away from the purely commercial centers and to take patrons to a section of the city that has the quiet of residential surroundings, but within reasonable proximity to amusement centers. In the larger cities the definite requirements of hotel types serve to indicate locations; but in smaller cities it is well to consider the possibility of locating in a logical section which is subject to development by attracting civic growth in that direction. It is not only true that hotels should be located in the path of high class residential or business expansion but also that in many instances the location of a new hotel will definitely encourage such growth. It is also well to consider the possibilities presented by adjacent apartment building development which will lend support to the restaurant and to the concessionaires depending upon transient trade as well as upon that of hotel guests.

In the matter of relative cost of land and building, it may be taken as a general economic theory that land should not exceed 20 per cent of construction and equipment cost. This point is primarily determined by community conditions affecting sub-rentals. If the primary income of the hotel is from the rental of rooms, a 20 per cent relationship limit should be maintained. If, however, there is an opportunity for providing stores and valuable concessions in the plan, it is logical to pay as much more for land as the additional sub-rental income may show to be a good investment as compared with the same space rented on a prevailing room rental basis. For example, a hotel located at 57th street and Madison avenue, New York, would probably bring no greater room rentals than if located on Central Park West. But in the Madison avenue location there might be a sub-rental equal almost to one-half of the income from rooms. Therefore a much higher land investment could be made at that point than at Central Park West, which is strictly residential in character.

Of course, the 20 per cent limitation must be highly flexible, and to a certain extent is regulated by the kind of hotel which is desired for the community. If transient trade were the larger element, it would be well to pay more for the land in order to obtain a more convenient transient location. If the hotel occupancy is to be divided between transient, semi-residential and club types (with a floor or two of smaller rooms with group bath and toilet conveniences to be offered at lower rents), the cost of land would probably be compatible with the rentals to be obtained from the class of guests and tenants anticipated. In the average community the tendency in hotel planning seems now to include not only provision of rooms for transient guests, including commercial travelers, but for housing of community activities and resident guests.

With the increased cost of building construction there is a trend toward the reduction in extent of non-paying public space, and even the provision of entertainment spaces is worked out in such a manner that when these are not in use for special functions they can be employed for the general use of guests, as public space which may be shut off and used for special functions when necessary. Thus, in one of the large older hotels in New York, encroachments have been made on what was formerly dining room space, grills and tea rooms. Here

the dining equipment has been removed, and this space is used for drawing rooms, writing rooms and other public conveniences except at times when it is required for special functions or for afternoon teas. Space which previously was equipped throughout with tables set up for 24-hour service has been doubled in its usefulness and with a reduction in overhead expense.

There are several methods through which the financing of the average hotel project is developed, but the primary problem is usually the first mortgage which may be obtained locally in the larger cities, but rarely in smaller cities or towns. Much of this mortgage financing is carried out by large mortgage bond companies which operate nationally or in limited sections of the country, and while the usual proportion of the first mortgage is 60 per cent of the cost of land and building, it is possible to obtain as high as 70 or 80 per cent where an amortization mortgage requires the payment of from 8 to 10 per cent of the principal each year.

The secondary financing is the more interesting for consideration, and this is usually provided by the sale of stock or second mortgage securities. It is practical to organize two companies, one to be the "holding company" for the ownership of the building and the other company an "operating company," unless the hotel is to be directly leased to an outside lessee.

The more successful manner of promoting the holding company is to present to purchasers of stock an opportunity to share in the profits of the operating company. As an example, we may relate the experience of a hotel owner in an active industrial city where the original hotel had practically outlived its usefulness and the citizens wanted a new hotel. This hotel owner was not financially able to bear the necessary investment cost, but he decided to build a new hotel which would absorb his present property, taking in with him, as joint owners, local manufacturers and merchants. The new holding and operating companies were organized, a long-term management contract given to the original owner, and two-thirds of the stock of both companies was offered locally and quickly absorbed. There was a keen interest in sharing the ownership of the company and profit of the operation. The holding company which financed the building was limited to a profit of 7 per cent in the form of a lease to the operating company, and it was found after going into operation that the operating stock brought up the income on the entire investment to better than 20 per cent. Thus the individual who did not want to limit the investment possibilities of his funds to 7 per cent was attracted to the proposition, and financing was quickly provided.

One of the most successful methods of financing the equity in a new hotel project is to arrange a lease which will obviously insure the safety of this investment with a good return to the investor. The lessee may be a well known hotel man or a hotel operating company having a sufficient reputation to assure prospective investors in the holding company. In nearly all cases the tenancy of a hotel lease is for 21 years. It is usually desired, but not always required, that if this is to be a newly formed operating company, the manager who may be brought in shall have an investment in the operating company. This is not usually a large investment, probably $10,000 on a term basis, but it serves to indicate sincerity and direct personal interest.

In the making of the original lease, it is customary that the lessee shall provide his own furniture, and as a rule the owning company accepts this furniture as the final security in making the lease. In fact it is highly desirable that the furniture shall constitute this security, as in case of any default it would be a serious interruption to the hotel's business to have the furniture taken out or subject to process of law. In order to cover the period before the hotel is furnished, a deposit is usually taken on the signing of the lease, equal to the value of furniture, and refunded to the lessee as the furniture actually goes into the building.

There are several forms of establishing rental terms in the hotel lease. Perhaps the most customary method is that the leasing figures shall be established on a basis of net percentage of the agreed appraisal of land and building value. Usually the tenant assumes all taxes, assessments, repairs and similar costs, including a net percentage on the property valuation, which varies from the 4 per cent requirements of large estate owners, to as high as 7 or 8 per cent of the actual investment value. An interesting form of hotel lease which is becoming more popular each year is on the basis of a price per room. Basic values are figured on a net or gross rental by room plus a percentage figure on sub-rentals. In many of the newer hotels, erected by speculative or investment builders, the owner rents the rooms to a managing lessee and retains all concessions and sub-rentals or the sub-rental space only. Thus, in one large hotel now under construction two general leases are presented in which the rooms are offered to a lessee for $375,000 a year and the stores have been placed on the rental market for $140,000 a year. This is a practical method of leasing in that it distributes logically divided interests. Where the owner retains sub-rental space, such as stores and shops, it is provided that the lessee of the room section of the building and the restaurants shall provide heat and sometimes light and janitor service in the stores, an allowance being made.

For general figures in estimating leases and furniture costs, it may be assumed that a $600,000 investment would produce in a moderate-sized city a 200-room hotel, which would be first class in its community. The furnishings in a hotel of that type would cost from about $500 to $600 per room, including the furnishing of public spaces and the equipment of the kitchen. For the average resort hotel furnishings are estimated at considerably less,

even as low as $200 per room in a house of 300 rooms or more, yet appropriate and in good taste.

It is generally figured that a room will be rented 250 days a year, and on this basis the value of the lease may be estimated. The hotel manager will estimate his operating cost at one and a half times the cost of his rent. Thus, in a hotel project where the lease is based on $300 per room per year, cost of operating will be about $450 per room per year, making a total cost of $750 per room per year on which there should be an income of $1,000 a year to make an attractive lease proposition. Thus, the net income from the lessee's viewpoint should be from 25 to 33⅓ per cent of his rental and operating cost. Out of this net income he must carry his investment interest, furniture depreciation and other business items, but the operating cost on a one and a half times rental basis includes taxes and similar charges.

In selling a hotel lease it is almost an established custom among brokers to show that the good-will value of the lease to a buying tenant will pay out through profits in three and a half or four years. In other words, the good-will of the hotel lease is worth four times its actual annual earnings.

In planning for income-bearing space, other than rooms, it is obvious that this space should pay a higher income than the same space given over to room rentals. Otherwise the introduction of the sub-rental or concession is not logical, unless to be of a service character valuable to the comfort of guests in the hotel. The architect's objective should be that every square foot of the building must produce some kind of income.

It is not considered desirable today to attract inside of the hotel people who are not guests. A great many hotels have removed many of the seats in their lobbies and corridors, and the tendency is to produce more of the club atmosphere, to which visitors to the hotel will come for the purpose of calling on guests or patronizing the restaurants.

The question of obtaining income from sources other than rooms and restaurants has become of the greatest importance in the planning of any hotel. Of primary interest are stores and shops which provide rentals sufficiently high to cause the use of ground floor or mezzanine space for such use. The provision of such shops is also a desirable form of service to guests. The various concessions incidental to the hotel's business should also be carefully studied according to local conditions. A partial list of shops and concessions to be noted in various hotels includes news-stands, theater ticket agencies, cigar stands, barber shops, billiard and bowling rooms, beauty shops, Turkish baths, gymnasiums, stock brokers' offices, railroad and steamship ticket offices, telephone and telegraph rooms, flower, novelty and drug stores, and similar service features.

From a business viewpoint concessions are handled by the operating companies in different ways, according to conditions. Often profitable concessions are operated directly by the hotel management. Where concessions are rented out, it is quite customary to arrange leases calling for a minimum rental and a percentage of the gross income, which varies from 5 to 12 per cent, according to the size and nature of the business. In any event, the space allotted to concessions should be deliberately incorporated in the plan rather than accepted as an accidental development of convenience after the floor plans are completed. If a concession is worth operating at all it deserves a logical location in the hotel plan, both for the convenience of guests and to insure profitable operation. A careful preliminary analysis of concessions should be made to determine present and future local demand and that of the specific traveling and resident patrons of types for which the hotel is primarily intended.

Another subject which should be given serious consideration, particularly for hotels in smaller cities and located on well traveled automobile routes, is the establishment of a garage directly under control of the hotel management. It is realized now by hotel men that an important percentage of guests may be obtained through automobile traffic, and the hotel which has garage accommodations, located conveniently and operated in a dependable manner, is certain to enjoy practically all business accruing in the district from this type of transportation. It is usually the case that guests using automobiles arrive rather late at night, and it is a decided drawback if they find it necessary to search around the town for a garage which may be open and in which it may be safe to leave an automobile with its accessories and traveling equipment.

One other important point should be stressed at all times. That is the grave danger of using inferior structural materials and cheaper forms of mechanical installation and equipment. Every hotel man knows by sad experience the cost of replacements and expensive repairs which may soon develop as a result of false economy in the original investment.

The life of the average hotel building is usually figured at about 30 years on a utility basis, but there is no reason why the investment should be written off in this comparatively short period if construction, equipment and location are wisely selected. Even as a chain is as strong only as its weakest link, so a hotel structure will invariably show a measure of failure in direct ratio to the inferiority of any important installation.

Architects invariably realize this condition when called upon to design any type of building. Unfortunately, however, it is often the case that an owner will hamper the architect's work and jeopardize his own investment by insisting upon false economy in order to hold down the original building cost.

In the building and equipment of the modern hotel there is no place for extravagance—nor cheapness! Every part of this machine called the hotel building must function daily, year in and year out.

Legal Restrictions Confronting the Hotel Architect

By FRANK K. BOLAND
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IN laying out the plans for a private dwelling or ordinary business building, the architect as a rule is not very seriously hampered by legal restrictions which cannot be readily complied with, but in planning for the erection of a hotel, on account of the complex nature of the structure and its varied uses, the situation is quite different. In the latter case, he must not only consider compliance with existing laws, but he should endeavor to anticipate possible subsequent modifications, amendments and extensions thereof. Too serious stress cannot be given to this thought, and the hotel owner, in planning future buildings, will profit materially by selecting the architect who will consider not only the architectural beauty, design or present economic uses thereof, but also in their construction will endeavor, as far as he can, to provide for such alterations as may be required by future regulations.

The growing tendency of the times is for laws, laws, more laws, and legislators and public officials always lend a willing ear to the public when demanding legislation where the stated purpose thereof is better protection of the health, safety and convenience of the public. Last year our New York state legislature passed an act to amend the labor law, by providing for a state standard building code covering places of public assembly; places of public assembly were defined as those maintained for pecuniary gain, where 100 or more persons assembled for amusement or recreation. Many of our hotels were brought within the purview of this law. The act provided that all such places should be constructed, equipped and maintained so as to afford reasonable and adequate protection to the lives, health and safety of all persons employed or assembled therein, and it authorized the creation of an industrial board for the purpose of establishing a code for the construction and equipment of such places. This act was state-wide in its application, and further provided that the places affected thereby could not be used unless a certificate had been issued by the proper authorities, showing compliance with all the prescribed rules and regulations.

This act necessarily required radical structural changes in many of our existing hotels, a strict compliance with which would practically preclude some of them from holding balls, lectures and other forms of amusement or recreation. However, the labor department, appalled at the enormity of the work required to be done by it under this new law, had the act amended, through its commissioner, so as to exempt places in New York City from its requirements, and hotels of more than 50 rooms in other places outside of New York City.

In New York City our building code, applicable to theaters and other places of amusement (some of our hotels coming within the latter category), requires that such buildings be approved by the fire and building departments as to conditions of safety in cases of fire or other catastrophe—all of which means an unbearable burden on the hotel owners' exchequers, where legislation of this kind was not anticipated when the premises were originally constructed. Legislation affecting the structural condition of our hotels is constantly emanating from the various public bureaus, health, building and labor departments, compliance with which invariably means an added strain on the owners' finances; how far these conditions may be anticipated is for the far-reaching eye of the architect to determine.

This condition is not local—it is country-wide. For example, from January 1 to March 1 of this year, of legislation introduced in the various states affecting hotels only, California introduced bills to regulate the height of hotels, also to require suitable seats for females when not on active duty, as well as a housing law with strict requirements as to construction and maintenance; Colorado, a bill providing for suitable places for employes to work; Connecticut, a bill to provide suitable seats for employes; Indiana, a bill to regulate steam boiler plants; Missouri, a bill to require fireproof chimneys and non-combustible roofs; New Jersey, a bill to require installation of wire ropes from sleeping rooms, in addition to fire escapes; North Dakota, a bill to require that guests' rooms be equipped with bolts, unlockable from the outside; Washington, a bill to regulate kitchens and dining rooms in basements, and forbidding their maintenance in buildings hereafter erected; and, Wyoming, a bill to provide better sanitary conditions in bakeries, hotels and restaurants. Many of these measures, apparently of secondary importance, have in fact made necessary substantial structural alterations.

With these considerations in mind, the architect who specializes in hotel construction will do well to take every precaution, and not hesitate to obtain expert advice on present and anticipatory legislation, before finally committing himself to a definite plan of construction; on the other hand, hotel promoters will profit much by having these thoughts in mind when advising with the architects selected.

As a result of the increasing complexity of the average new hotel project the fact is indicated more clearly every day that there are four distinct phases or viewpoints involved in each undertaking: financial, physical, management and legal. Each contributes in its own proportion to the problem of *planning,* which is the architect's problem. If any of these phases fails to receive due consideration a weakness develops in the plan which if not immediately effective possesses potentialities of danger.

Modern Hotel Construction Methods

By W. J. THOMAS, *Engineer*
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THE construction of a modern hotel is an activity of unusual complexity. To a degree greater than in other types of building there must be co-ordination of numerous trades and special equipment makers; materials of construction and mechanical equipment must be selected and installed to endure as nearly as possible throughout the active life of the building without serious replacement, and the whole must be delivered for actual hotel operation on a date fixed long in advance by financial and other considerations. The use of the building and the fact that it represents a long term investment of the owner require that irrespective of local building ordinances the construction should be made as thoroughly fireproof as practicable.

When the owner has made a selection of a site as one suitable for the location of a hotel, the engineer's duties begin. The first step should be that of procuring an accurate survey of the ground giving all information as to property and street lines, locations and encroachments of adjoining buildings; also elevations of sidewalks, curbs, and intersections of lot lines, and in addition all possible information regarding public and private utilities.

The engineer's most important duty is to report on the character and composition of the subsoil underlying the site. He should set forth the conditions that may be expected, so that proper precautions may be taken in the design and construction of the foundations and for the protection of adjoining buildings. Whenever possible, such an engineering survey should be made before the purchase of the property. This precaution would prevent the selection of a site involving expensive and difficult foundation operations, when in many instances an equally good location, from a hotel operator's standpoint, requiring less expensive foundations, could have been secured.

Before any plans have been started the engineer should make a personal inspection of the site and the surrounding neighborhood so as to acquaint himself with the general topography of the district and observe the type of buildings already erected. The superficial information gained by this inspection will bring to the attention of the observer any peculiar conditions requiring special treatment, such as outcropping rock, proximity to a stream, condition of buildings adjoining the lot lines, or steep street grades which affect the adaptability of the site for foundations. This will lead to further inquiry at the local building department, architects' and builders' offices as to the type of foundations used, soil loads generally adopted, and the probable subsurface conditions to be encountered. All these precautions precede and lead to the actual mechanical exploration of test borings and soil loading tests, which should be conducted regardless of conditions reported to have been found even on the property adjoining the site.

The borings and samples of the materials found for each foot in depth will make possible the determination of the stratification and nature of the soil below the surface of the site and will also fix the ground water level, from which the probable hydrostatic head to provide for on basement floors and walls can be figured. From this data the engineer can decide on the type of foundation best adapted to subsurface conditions. If spread footings are found to be preferable, load bearing tests should be made at the level of the bottoms of the lowest footings so as to arrive at a safe bearing value per square foot to use in the design of the foundations. Should the soil conditions and the ground water level be more favorable to the use of piles, the load-carrying capacity per pile should be found by driving test piles at the level of the bottom of the footings. It may be found necessary to sink either open or air caissons to rock or other good bearing strata for the foundations. If, when sinking, a satisfactory bearing level has been reached, a careful inspection should be made to obtain accurate knowledge of the underlying soil characteristics. When indications so warrant, tests should be made on the bearing value of the soil at the bottoms of the caissons.

Where the ground water level with relation to the basement floor and other underground floor areas is such as to produce hydrostatic pressure on the floors and walls below grade, it will be necessary for the designer to consider the construction of these portions of the work in connection with the foundation design, and provide floors and walls of sufficient strength, properly anchored to the foundations, to withstand the water pressure.

The use of the underground areas for the power plant, engine-room, laundry and other working or service parts, and in many instances for public parts of the hotel, such as grill room, Turkish baths, etc., necessitates provision for water-tightness and damp-proofness which should be given the same study and attention as that given to the foundations. The material and design of the walls and floors should be considered in deciding upon a method of waterproofing; also the location of water and steam service lines to mechanical equipment, as well as the drainage and waste lines, will have considerable bearing on the method adopted.

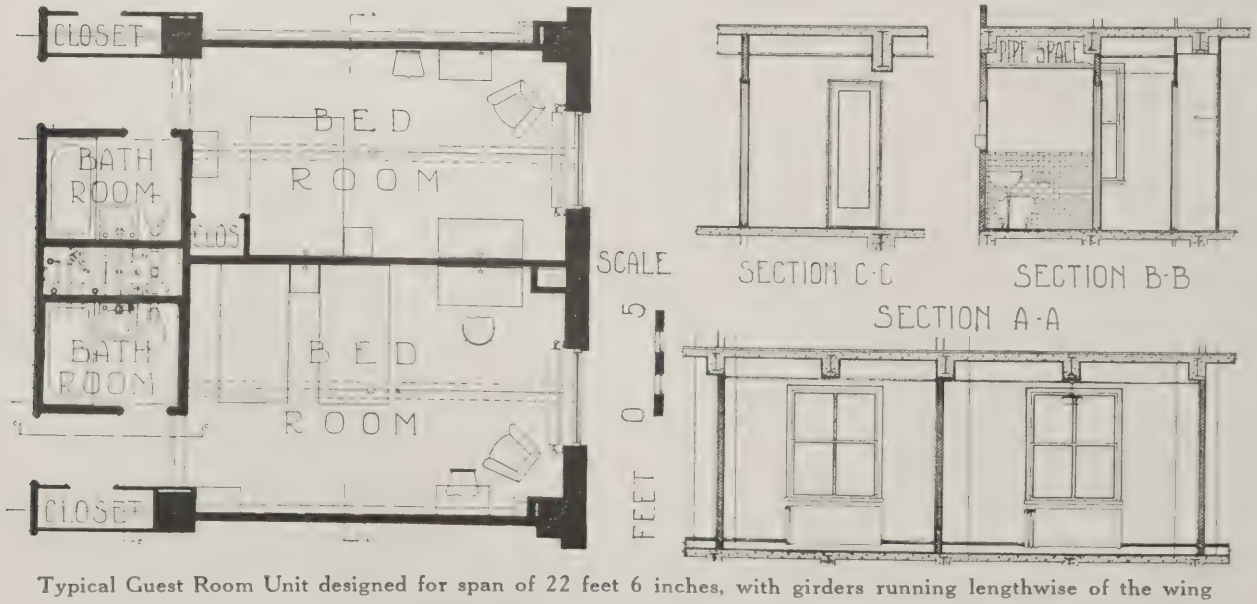
Concrete, reinforced, is probably best adapted to the use of basement walls and floors which are sub-

jected to water pressure, principally because of its cheapness and its ability to resist tensile stresses, which permits of a design using a minimum thickness for retaining walls and basement floors. Its freedom from joints makes waterproofing more effective.

Waterproofing may be accomplished by either the membrane or the integral method. The membrane method consists of using felt or fabric as a reinforcement, saturated with either asphalt or coal tar pitch and applied to either the exterior or interior of the surfaces to be waterproofed by building up, in shingle fashion, the layers of membrane alternating with heavy moppings of the waterproofing material. The integral method is that wherein the waterproofing materials, consisting of paste, liquid or powder, are added to either the gauge water or the cement used in concrete mixtures. Both of the waterproofing methods have their special advantages, and the waterproofing problem of any particular structure can be solved only after a thorough study of the controlling factors in the design. In general, the integral method is used for vertical surfaces and the membrane method for horizontal surfaces. The floor surfaces of working parts of the basements are generally granolithic with membrane waterproofing between the finished surface and the top of the slab. An extra precaution is to place integral waterproofing in the slab. In kitchens and the connecting departments, quarry tile makes a good surface. In the working parts the usual waterproofing will provide dry walls, and the cement or tile finish can be applied directly to the concrete. In the public rooms of the basement it is well to fur the walls sufficiently to give a generous air space between the finished interior and the structural concrete to care for condensation.

Just as in the development of the architectural plan, the layout of the typical bedroom floor is the key to the structural scheme of the building. The steel-framed structure is best adapted to the needs of a hotel because of its elasticity in meeting varying conditions of load and span and for its rapidity of construction. Reinforced concrete has its special merits also, but it is not economical unless it can be reinforced in two directions. This necessarily means girders on all four sides of a bay, and the girders projecting into the rooms and running across their widths are serious handicaps to good room arrangement. In general, it may be said that an economical architectural room layout will result in an economical steel layout. The column layout should always be determined by the room layout; while it might theoretically appear cheaper to arrive at the most economical column spacing and steel framing and fit the room partitions to them, the consequent juggling of partitions, furring and lack of uniformity in room sizes, finish, etc., more than offset any saving. Column spacing will vary therefore from 16 to 24 feet on centers and beam spacing from 5 to 8 feet, depending on the standard room.

In the construction of the Statler and other hotels with which the writer has been identified, 22 feet 6 inches has been generally adopted as the long dimension of the bay. The girders are run the length of the wing, which permits them to be hidden by the partitions between bathrooms and sleeping rooms or to pass over the bathrooms and foyers when they are concealed by furring down these small areas of ceiling. This scheme leaves the room ceiling free of projecting girders and the smaller steel floor beams which run lengthwise of the rooms can with little trouble be arranged at the partitions and in the centers of the rooms. On an irregularly shaped lot this, of course, cannot be worked out so easily, and in that case a suspended ceiling is generally necessary. In New York the building code permits the clear ceiling height to be figured to the



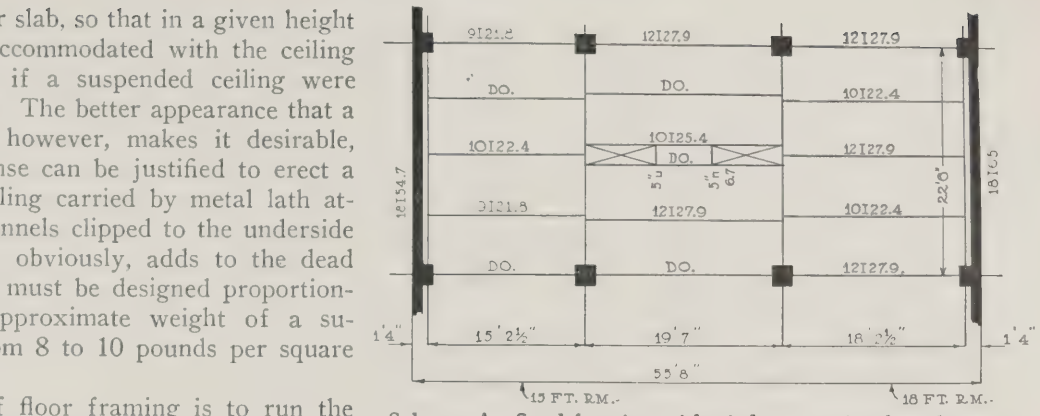
Typical Guest Room Unit designed for span of 22 feet 6 inches, with girders running lengthwise of the wing
Geo. B. Post & Sons, Architects

under side of the floor slab, so that in a given height more floors can be accommodated with the ceiling beams exposed than if a suspended ceiling were built to conceal them. The better appearance that a flat ceiling presents, however, makes it desirable, when the extra expense can be justified to erect a suspended plaster ceiling carried by metal lath attached to furring channels clipped to the underside of the beams. This, obviously, adds to the dead weight, and the steel must be designed proportionately heavier; the approximate weight of a suspended ceiling is from 8 to 10 pounds per square foot.

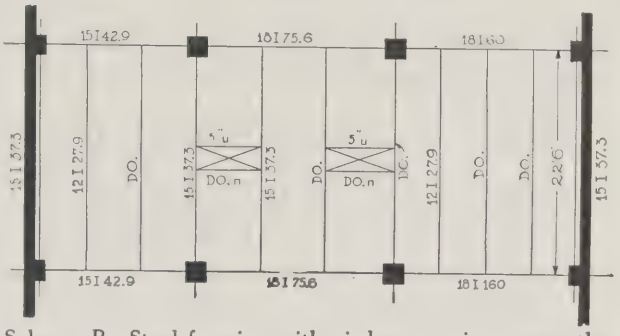
Another method of floor framing is to run the girders across the wing; this has a certain advantage in stiffening the frame and reducing the amount of steel required for wind bracing; but it brings the projection of the girders into the rooms, and the partitions cannot be made to line with the beams, resulting in a ceiling that is not in keeping with a first-class hotel. There is reproduced herewith a standard double unit, giving the finished appearance of the rooms with girders running lengthwise of the wing and the floor beams arranged with regard to position of partitions. Accompanying it are steel framing diagrams of a wing 55 feet 8 inches wide which provides rooms 15 and 18 feet in depth respectively on opposite sides of the corridor. The column spacing in each case is the same; the weight of steel in Scheme A, with girders running longitudinally, is 11.2 pounds per square foot, and in Scheme B, with girders running transversely, is 10.6 pounds per square foot. The advantages of Scheme A as enumerated are sufficient, however, to justify its choice in most instances.

This weight of steel provides for dead and live loads, but does not take into consideration steel required for wind bracing. There are many different paths over which the wind loads may be assumed to travel in reaching the foundations, and the choice of the members to be utilized in carrying the wind load will depend on the conditions to be met in the particular problem one has at hand. By selecting such bays in each wing in which the column spacing is continuous from the top of building to the basement for carrying the wind load, but slight additional steel is necessary. The greatest economy in steel is offered by the method of taking the wind loads directly into each bent of columns running parallel to the direction of the wind, since it is often found that the columns and beams as designed for dead and live load stresses are large enough to carry the wind stresses. This is especially true where the girders in the floor system run parallel to the direction of the wind. The wider the wings are, the less wind bracing will be required.

Live floor loads vary, of course, with local building ordinances. Guest rooms vary from 40 pounds (in New York) to 60 pounds; some cities require as high as 75 pounds for corridors and 120 pounds for ball rooms. Safe and recommended practice is



Scheme A. Steel framing with girders running lengthwise of wing. Weight, 11.2 pounds



Scheme B. Steel framing with girders running across the wing. Weight, 10.6 pounds per square foot

40 pounds per square foot for guest room floors and corridors and 100 pounds for the public portions.

One hope of lower construction costs lies in standardizing building codes in such details as floor loads so that unnecessary material is not required, and also in obtaining general recognition of higher tensile stresses in steel. The American Institute of Steel Construction, which represents 90 per cent of all steel fabricators throughout the country, has adopted a new structural steel specification prepared by a group of leading engineers in which the allowable unit stress in bending has been increased to 18,000 pounds per square inch of net cross section. The general adoption of this specification would save large sums in cities where the present allowable stresses are much lower, and in those sections where no ordinances exist, it would provide a standard basis for comparative estimates.

Interior partitions constitute an element of importance today, both from a standpoint of floor space occupied and dead weight. The usual partition is of 3-inch hollow tile or gypsum block plastered on both sides, the choice generally depending on market conditions at the time of placing the contract. In recent years interest has grown in the use of a solid plaster partition with a reinforced metal lath core. The advantages claimed for this are a saving of floor space, since it is only 2 inches thick compared with 4 inches for other partitions, and a saving in steel because of its lighter weight. It requires the use of special electrical outlets and fittings that will finish flush with the walls. In order

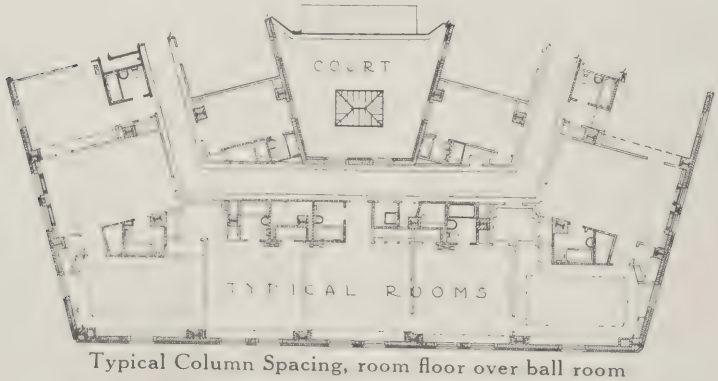
to effect the saving in steel it is necessary to settle upon the use of the thin partition at the outset; this is not always practicable, and as a matter of safe practice it is well to figure the steel to take care of the heaviest partition that may be decided upon; 25 pounds per square foot is sufficient. Elevator shaft walls should be of 6-inch block.

Special framing requirements are found in hotels, due to differences of span in the typical and public floors. Construction difficulties can be greatly lessened through careful planning. In all cases possible the public rooms should be placed with reference to the typical column spacing; their widths should conform to the widths of the typical wings, in which case a clear span can be arranged with trusses 12 to 14 feet deep concealed in the partitions above to carry the weight of the upper floors. The members of the truss are so designed that the corridor continues through, and such other clear openings as required may be made. When the clear span of the public room is greater than the width of the wing, not only the interior columns but the court wall also have to be carried on the trusses, and this situation should be avoided whenever possible. An ideal solution from a structural viewpoint is seen in the new Roosevelt Hotel in New York where the large ball room is placed directly under the court roof, requiring framing only heavy enough for the roof.

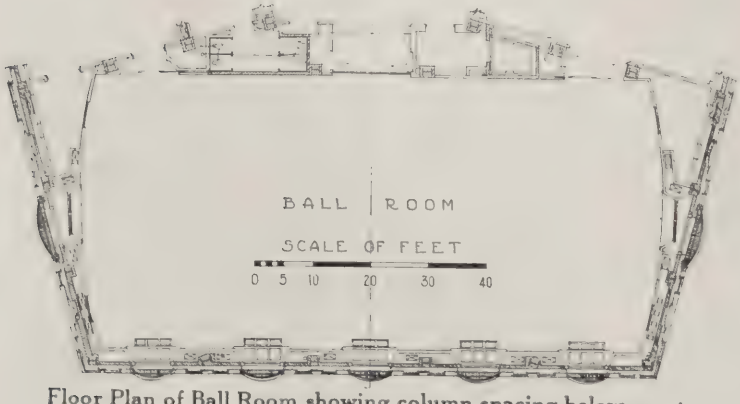
The column spacing established on the main floors because of public room sizes should be carried through the basement and sub-basement. This will give sufficient space free of columns to accommodate easily the large equipment of engine and boiler rooms, laundry and kitchen.

Careful provision should be made to insure adequate shafts for the large mass of piping and wiring required in a modern hotel. The standard practice of grouping two inside bathrooms about a common shaft meets this requirement in adequate fashion for vertical space. Sufficient horizontal space can also be arranged by furring the ceilings of bathrooms and entrance foyers. It should never be necessary to raise the floor level of the bathroom to accommodate piping. When radiators are placed below the windows on the side of the room opposite the bathroom the risers are furred in, and the horizontal lines are run in chases cut out of the exterior wall. Roof conductors can also easily be accommodated in the bathroom shafts.

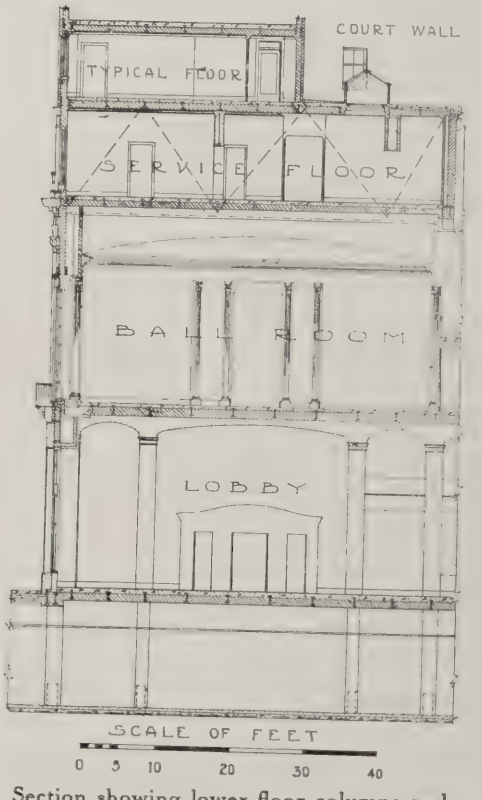
The various structural details of a hotel should be designed with the idea of minimizing maintenance cost constantly in mind. Shower baths should be carefully waterproofed, and the iron door bucks now commonly used should be protected at the floor level of bathrooms with tile plinths. This will prevent corrosion from contact with water that is apt to lie on the floor occasionally. Corridor floors, walls, door and window trim should all be selected to provide long service. It is distinctly economical to use metal window sash and frames, metal baseboards in the rooms, and the very best grade of hard finish plaster obtainable.



Typical Column Spacing, room floor over ball room



Floor Plan of Ball Room showing column spacing below guest room floor



Section showing lower floor columns and ball room truss

Hotel Statler, Detroit
Geo. B. Post & Sons, Architects

GENERAL VIEWS OF EXTERIOR

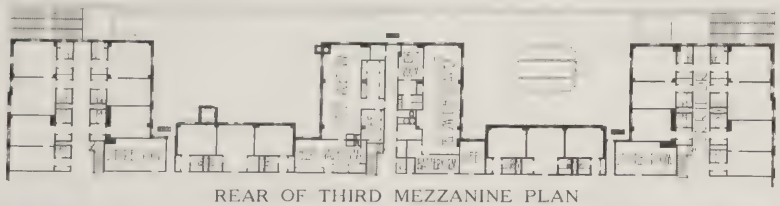
LOS ANGELES-BILTMORE HOTEL, LOS ANGELES

SCHULTZE & WEAVER, ARCHITECTS

LOS ANGELES-BILTMORE HOTEL, LOS ANGELES

Illustrations on Plates 73-79

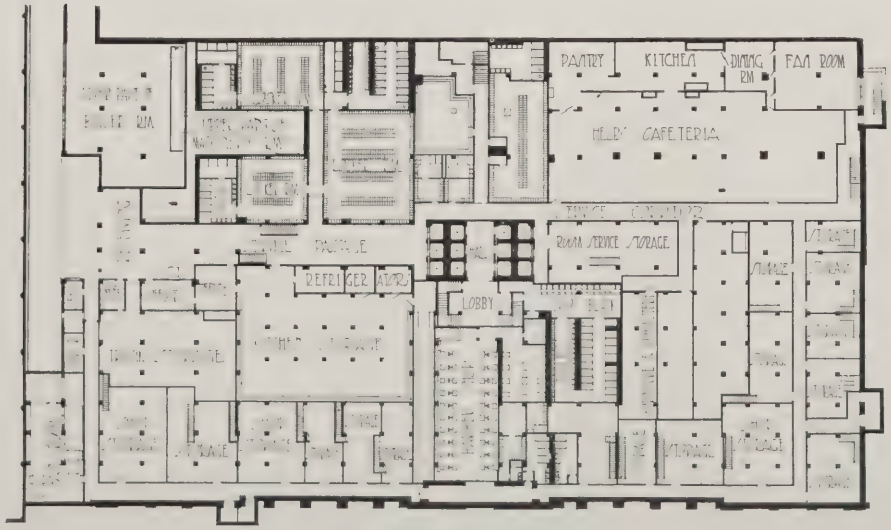
Power for the hotel is supplied by central station service. Heating is by a two-pipe steam system from oil fuel; gas is used in the kitchens. Ventilation is supplied the public rooms and spaces below the street; air supply for the public rooms is washed. A refrigeration plant of 100 tons capacity is installed, also a water-softening system, and a stationary vacuum plant of two units, each with a capacity of eight sweepers. Construction was begun April 21, 1922, and the completed hotel was turned over to the operating company on October 1, 1923.



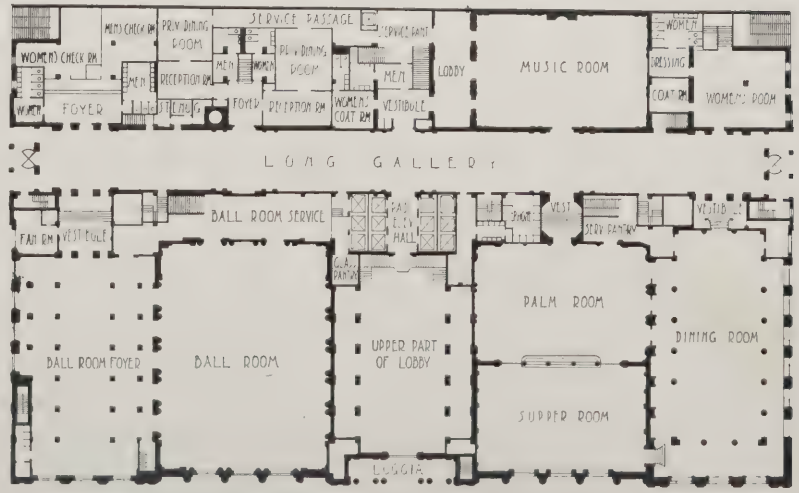
REAR OF THIRD MEZZANINE PLAN

REAR OF SECOND MEZZANINE PLAN

TYPICAL FLOOR PLAN

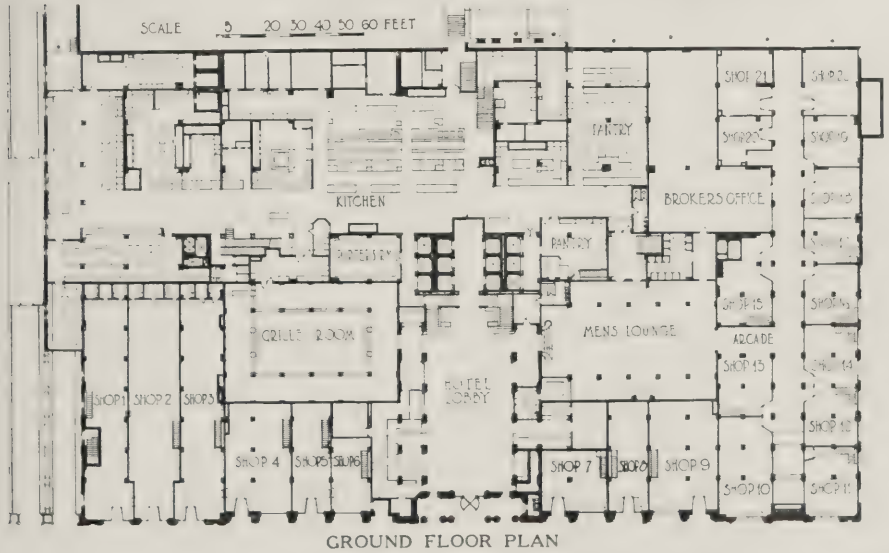


BASEMENT FLOOR PLAN



FIRST MEZZANINE FLOOR PLAN

DETAIL OF MAIN ENTRANCE



GROUND FLOOR PLAN

This building is the largest hotel west of Chicago, and in the spaciousness of public rooms excels any hotel in the country. There are 916 guest rooms and 826 bath rooms. The total dining capacity, including private dining rooms, is 2500; the ball room accommodates 650 people. These rooms are served by two kitchens and five serving pantries.

The construction is fireproof, of steel frame with reinforced concrete floors. The exterior materials are granite and limestone on the lower stories and light red brick with terra cotta trim above.

LOS ANGELES-BILTMORE HOTEL, LOS ANGELES

SCHULTZE & WEAVER, ARCHITECTS

Los Angeles-Biltmore Hotel Photos. © by Keystone Photo.

MAIN DINING ROOM

LOS ANGELES-BILTMORE HOTEL, LOS ANGELES

SCHULTZE & WEAVER, ARCHITECTS

LONG GALLERY ENTRANCE TO BALL ROOM

WALL FOUNTAIN IN LONG GALLERY

LOS ANGELES-BILTMORE HOTEL, LOS ANGELES

SCHULTZE & WEAVER, ARCHITECTS

DETAIL OF BALL ROOM
LOS ANGELES-BILTMORE HOTEL, LOS ANGELES
SCHULTZE & WEAVER, ARCHITECTS

MEN'S GRILL ROOM ON GROUND FLOOR

THE LONG GALLERY

LOS ANGELES-BILTMORE HOTEL, LOS ANGELES

SCHULTZE & WEAVER, ARCHITECTS

SUPPER ROOM LOOKING INTO PALM ROOM

FOYER OF BALL ROOM

LOS ANGELES-BILTMORE HOTEL, LOS ANGELES

SCHULTZE & WEAVER, ARCHITECTS

DETAIL OF ENTRANCE FRONT

GENERAL VIEW ACROSS LAKE

WADE PARK MANOR HOTEL, CLEVELAND

GEO. B. POST & SONS, ARCHITECTS

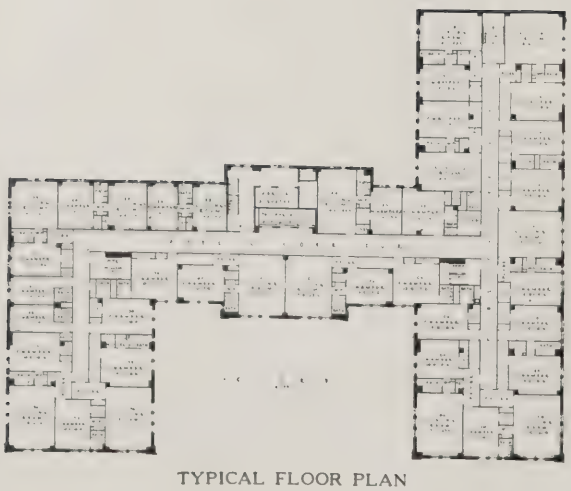
Photos, Schuyler Carteret Lee

WADE PARK MANOR HOTEL, CLEVELAND

Illustrations on Plates 80-84

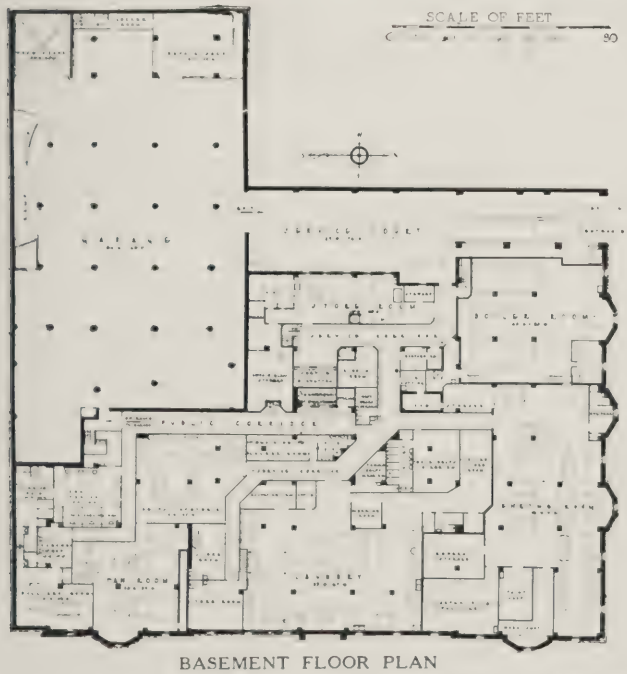
This hotel is of residential type, with 400 guest rooms and 260 baths grouped in small suites. The main dining room seats 262, and a private dining room 41; the ball room accommodates 220. There is a main kitchen with a banquet pantry and help's cafeteria. An unusual feature is the warming pantry with each suite. They are equipped with sinks and duplex electric outlets to meet light cooking requirements; no ice provisions are made.

The construction is steel frame with metal joists; the exterior is finished in red brick and terra cotta. Power is from central station service, and heating by two-pipe vacuum return system. Mechanical equipment includes supply and exhaust in public and service rooms; air washing on supply systems; refrigerating plant; water-softening apparatus and vacuum cleaning. The building contains 3,316,500 cubic feet, and was completed in March, 1923.

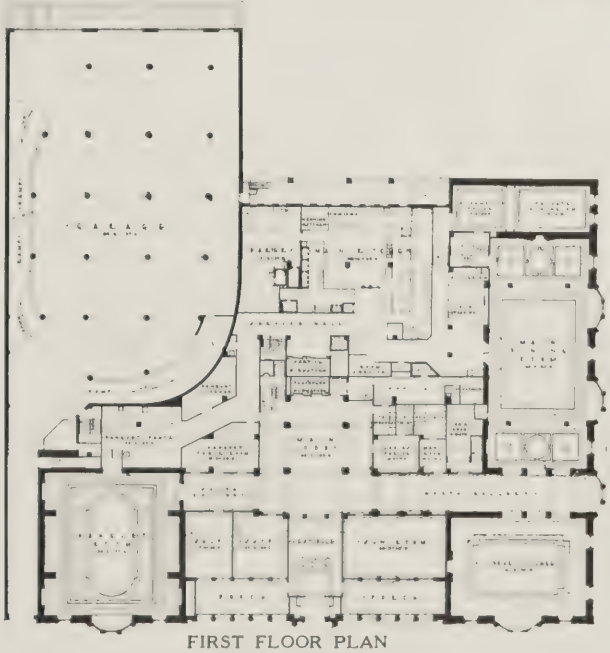


TYPICAL FLOOR PLAN

DETAIL OF ENTRANCE



BASEMENT FLOOR PLAN



FIRST FLOOR PLAN

WADE PARK MANOR HOTEL, CLEVELAND

GEO. B. POST & SONS, ARCHITECTS

MAIN LOBBY TOWARD ENTRANCE

ENTRANCE VESTIBULE

WADE PARK MANOR HOTEL, CLEVELAND

GEO. B. POST & SONS, ARCHITECTS

BALL ROOM

MAIN DINING ROOM

WADE PARK MANOR HOTEL, CLEVELAND

GEO. B. POST & SONS, ARCHITECTS

TEA ROOM

LOUNGE LOBBY

WADE PARK MANOR HOTEL, CLEVELAND

GEO. B. POST & SONS, ARCHITECTS

The Planning and Equipment of Hotel Kitchens

By ALBERT E. MERRILL,
Equipment Engineer, Chicago

SO wide a variation exists in the requirements of the same sized hotels, so far as the kitchen equipment is concerned, that it is very difficult to give any general rule which will apply to all conditions. The general obstacle which the equipment engineer has to overcome is limited space, and it may be safely assumed that 75 per cent of the present kitchen space is too small, and that a great saving in labor, wastage and loss of patronage could be effected by giving suitable consideration to this important department of hotel operation.

In this article we will consider the plants of three representative hotels, from the modern apartment hotel proposition, where the kitchen requirements are generally the least, to the modern metropolitan hotel catering especially to banquets and special service, where the kitchen space must be the largest. The reproduction of the kitchen perspective plan of the Drake Hotel, Chicago, Marshall & Fox, architects (Fig. 1), is an example of the latter class and one where neither amount of equipment nor space requirements have been slighted in any degree. It also illustrates the conditions which are often met in any large kitchen; that is, exits to dining room at opposite ends, ample room for service equipment, and space for banquet preparation. The arrangement is also typical in that the service portion forms a hollow square through the logical center of the room, with ample silver heaters, dish heaters and tray tables through the center aisle. On one side of this are banked the main dish heaters, cooks' tables and bain maries, back of which are the ranges; on the opposite side are the cold counters, pastry counters and garde manger counters, backed up by preparation rooms for the various departments.

The ideal shape of any kitchen is as nearly square as possible, with the supplies entering from one side and gradually moving through the various departments to the service counters, where they are secured by the waiters. In the Drake kitchen we find a partition back of the ranges where the various refrigerators and work tables required for supplying short-order service are located, and at one end of this line is the short-order counter, where also are located the coffee urns and places for preparing toast, cakes, waffles and eggs. Still farther back we are met with the steaming room, supplied with vegetable preparation equipment, a large battery of soup kettles, pot roasters, and two large sectional steamers. At one end of this room is the pot washing department. On the opposite side of the hollow square we find directly back of the pastry counter a large ice cream storage cabinet in which can be stored some twenty varieties of ice cream in plain and fancy form. Still farther back from this room is the bake shop, which is divided into two distinct departments, one for making bread and rolls and the other for preparing French pastry. Back of the cold meat counter are the various meat choppers, slicers and other equipment required. Directly back of the salad preparation counter we find a large refrigerator which extends also behind the cold meat counter and supplies all the necessary finished prod-

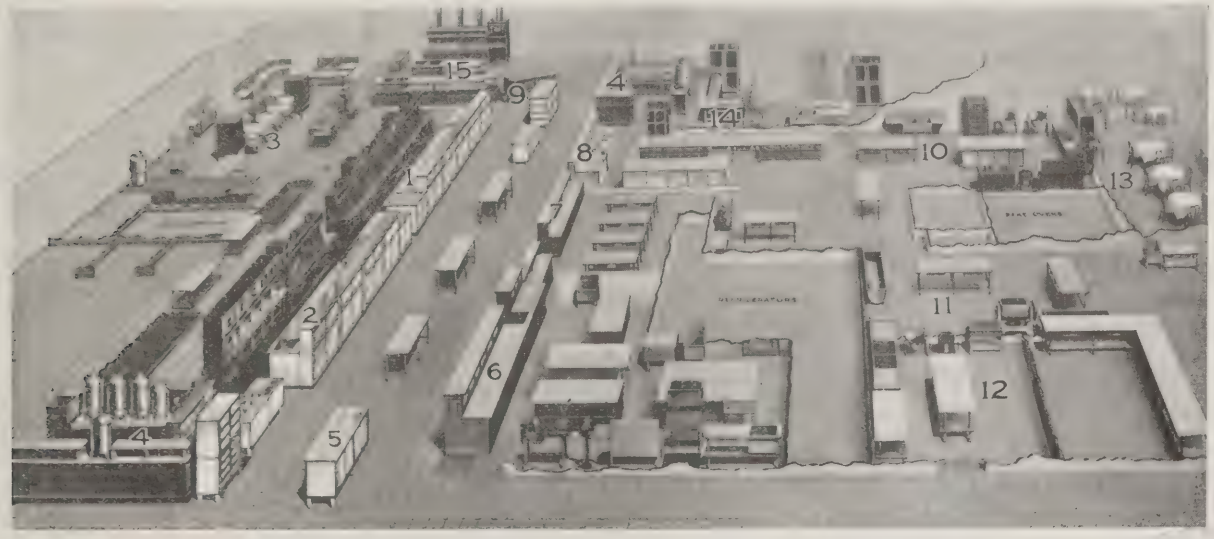


Fig. 1. Perspective Plan of Kitchen in the Drake Hotel, Chicago
Marshall & Fox, Architects

1. Range section
2. Broiler section
3. Vegetable preparation department
4. Coffee pantries
5. Dish and silver heater
6. Garde manger
7. Fruit pantry
8. Ice cream pantry
9. Checker's desk
10. Bake shop, pastry section
11. Bake shop, bread section
12. Confectionery section
13. Dining rooms for officers
14. Cafeteria for guests' maids and chauffeurs
15. Help's kitchen

General View, Kitchen of the Sheridan Plaza Hotel, Chicago
W. W. Ahlschlager, Architect

ucts for both of these very important departments.

To the right of the service department is located the dish and silver cleaning room. Conveyers carry the baskets of soiled and clean dishes to and from the various dining rooms. In front of this department is the service bar for cold drinks, which is not as large or as much used as in previous years. In one corner of the room we find the main storage refrigerator, which in this case is divided into eight compartments, with a large vestibule opening between them. On the opposite side of the wall from this is the main storeroom, a veritable grocery store, where all goods are delivered, and after being properly weighed are stored in bins or, if of a perishable nature, are carried directly to the storage refrigerator.

Quite in contrast to the Drake kitchens, where we find a total kitchen space of approximately 30,000 square feet, there is shown a plan (Fig. 2) of the kitchen of the Sheridan Plaza Hotel, Chicago, W. W. Ahlschlager, architect, which occupies less than 10,000 square feet, exclusive of the storeroom and storage refrigerators, which are located on the floor below. Here the shape of the room dictated an entirely different scheme of arrangement and made it impossible to locate the preparation departments directly back of the service departments. Consequently, we find the steamer room in one corner and the vegetable preparation, poultry, ice cream and bake shops at the opposite end. In each of these kitchens all departments required for a first-class service are represented, yet the space requirement, in the case of the Sheridan Plaza, is less than one-third of that devoted to the same purpose at the Drake. The sizes of the hotels, as far as number of rooms is concerned, are not essentially different, but the Drake caters to service dining rooms, having a total seating capacity of 750 and numerous banquet rooms, which are used nightly, and which have a combined seating capacity of over 1,500; while at the Sheridan Plaza the main dining room seats about 300, a cafeteria approximately the same number, and one banquet room also about 300.

The third plan (Fig. 3), of the kitchen of the Wade Park Manor, in Cleveland, George B. Post & Sons, architects, exemplifies the modern apartment hotel of approximately 500 rooms, with a single dining room seating about 200 and a small banquet room accommodating about 250. This kitchen occupies a floor space of about 10,000 square feet and, the shape being more nearly in the form of a square, allows to a certain extent the location of a preparation department back of each service department.

A study of the three plans, all representing efficient kitchen installations, and for hotels of approximately the same size, will evidence the fact that general rules as to space requirements and location of equipment are subject to wide variation and depend upon the class of business to which a hotel caters and to

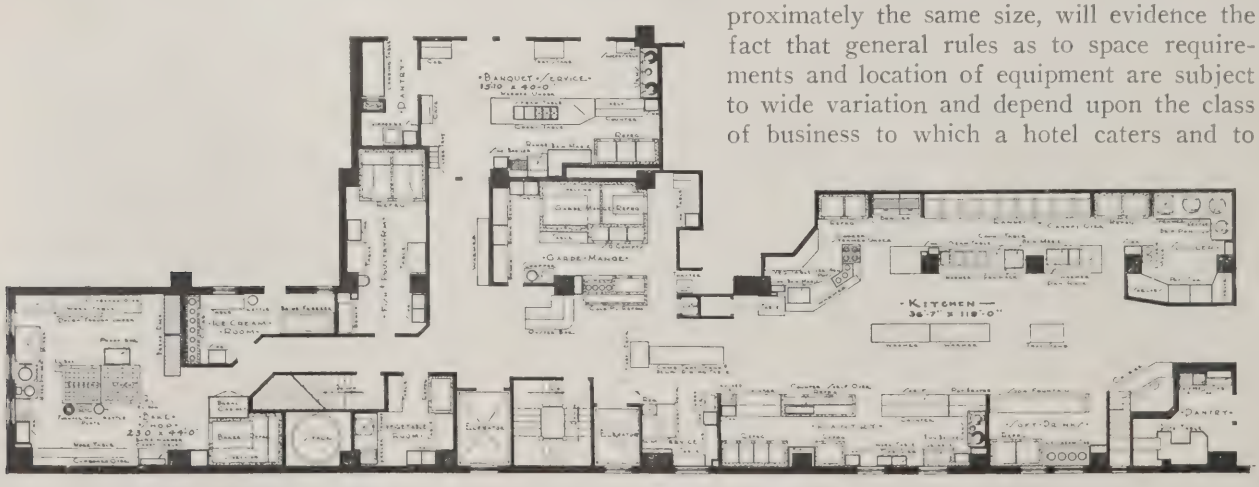


Fig. 2. Floor Plan of the Kitchen of the Sheridan Plaza Hotel, Chicago
W. W. Ahlschlager, Architect

the knowledge and experience of the operator. A general consistency, however, does exist, and in the statements which will follow, averages rather than actualities are made as their basis.

A hotel of 500-room capacity should have dining room space, exclusive of banquet room, approximating 10,000 square feet, giving a seating capacity of about 700 people. This dining room space may be either entirely of the service variety or it may include a cafeteria or a popular-priced coffee shop or lunch room. In addition to this space, all hotels must be provided with one or more large banquet rooms accommodating from 200 to 300 persons at a sitting.

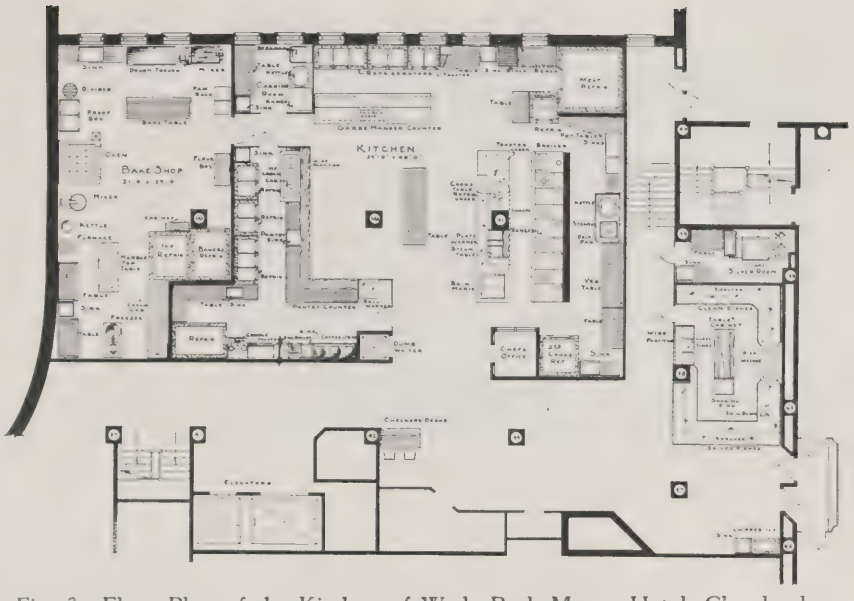


Fig. 3. Floor Plan of the Kitchen of Wade Park Manor Hotel, Cleveland
Geo. B. Post & Sons, Architects

In order to have the service prompt and efficient for this amount of dining room space it is necessary that at least 1½ square feet of kitchen be provided for each square foot of dining area, or in this instance, approximately 25,000 square feet, or an average of 50 square feet per hotel room for kitchen and dining room combined. In the Drake, however, the combined space has more nearly approached 100 square feet per room, and instances are common in smaller hotels featuring only their rooms where as little as 25 square feet per room has been allowed.

In the arrangement of the kitchen first consideration must be given to the supply entrance. This necessarily must be conveniently located to the main storeroom and storage refrigerator. In most instances these are located in basements, and supply elevators and broad stairways must lead directly to them and large scales be furnished to check the weights of all goods. The storage refrigerator should never have less than four compartments and a floor area of less than 500 square feet. Having determined the supply entrance, the next consideration should be given to having these supplies move forward to the various departments of preparation, then to service counters with the least possible retracing of steps. The kitchen proper, as already said, should be of the hollow square arrangement and fitted for right-hand service to the main dining room, if possible. The right-hand side should be supplied with a steam table, short order counter and pantry counter, while on the opposite side should be located the garde manger counter, pastry counter, soda fountain and checker's desk. Back of these stations, if possible, and if not, as closely located as the shape of the room will permit, are placed the preparation rooms for these various departments. The center of the room is provided with a series of dish heaters, silver heaters, a roll warmer or two, and all of them should be built of such height as to form a convenient tray rest. The fronts of all the service counters are to be built with the front section elevated about 15 inches above the level of the working space back of it, and the counters are either heated or refrigerated according to

View of the Kitchen, Wade Park Manor Hotel, Cleveland
Geo. B. Post & Sons, Architects

Fig. 6. Vegetable Department of Sheridan Plaza Hotel, Chicago, showing sectional steamer and jacketed kettles

requirements. The front sections are supplied with either lift or sliding doors to prevent the dishes or silver which they contain from becoming dusty, and the working space back of them is to be fitted with the various bain maries, steam tables, sinks, etc., that are necessary to keep the hot food hot and the chilled food cold. The cross section through the steam table (Fig. 9) indicates the manner in which these counters are built.

Nearly every kitchen must meet the requirements of dining rooms located in different directions and, consequently, extra steps are provided at opposite ends of the service counters and, as in the case of the Drake, double pantry counters. The aisle between the service counters must be made amply large to accommodate the number of waiters which the dining room will require. One waiter cannot profitably take care of more than three four-chair tables and, consequently, if the combined dining room space accommodates 600 persons, 50 waiters will be necessary, and at least half of them will be in the kitchen at one time. Where the dining rooms are not located on the same floor as the kitchen, service pantries adjacent to these dining rooms are necessitated, as otherwise the service would be entirely too slow.

In these service pantries there should be space for preparing short orders supplied with a short-order box, range and broiler, also a steam table and dish heater for entrees and a small pantry counter with coffee urns, all these arranged in the order already mentioned and, together with a checker's stand, located at the head of the stairs leading to the main kitchen. All entrances to the dining rooms should be guarded by vestibules with double entrance doors for right- and left-hand entrance, so that the confusion and noise of the kitchen may not be objectionably noticed by the diners.

Nearly all large hotels find it profitable to have the dish-washing pantry for the entire number of dining rooms centrally located and to convey the dishes to and from this pantry by belt conveyers carrying metal dish baskets filled with the soiled dishes and cleaned and returned with the clean dishes. This serves a double purpose of creating less confusion in the kitchen by minimizing the number of bus boys, and also is far more economical from a help standpoint than would be the case with a separate dish pantry located conveniently to each room. One general exception to this rule is that a separate dish pantry for banquet dishes is maintained, and these dishes are kept in suitable dish heaters especially for that purpose and not mingled with the tableware of the main dining room.

All hotels must give consideration to room service, and again separate dish heaters and silver heaters are supplied and table space arranged so that set-ups may be made ready to be put on the elevator and carried to the floors where they are to be used. In very large hotels separate room service pantries are maintained on each floor for this purpose, but this is not a necessity in a 500-room hotel. Separate closets and heaters for this service are almost a necessity to keep a check on what is delivered and returned to avoid probable theft.

We will consider briefly the types of construction for each department and the various arrangements which prevail.

Refrigerators today are nearly all built of concrete and sheet cork. The walls should be of a total of 7 inches in thickness, including two thicknesses of 2-inch sheet corkboard laid in cork cement and covered on both sides with concrete surfaced

Fig. 7. Dish Washing Pantry of the Drake Hotel, Chicago, showing dish conveyers and dish washing machines

with cement. In the main storage refrigerator it is possible to have the coils hung directly on the walls of these boxes without baffle walls between them and the storage space, because as a general thing they are located away from the kitchen and are not opened as frequently as these boxes, and the liability for condensation on the provisions and walls of the box is thus minimized. However, if the boxes are located in the main kitchen, or if they are service refrigerators, it is necessary to build an insulated baffle wall between the coils and the storage space, if dry boxes and dry provisions are to be insured.

Very little consideration is given today to refrigeration by means of ice, as it is far more economical and vastly more cleanly to use artificial refrigeration. Both ammonia and carbon-dioxide plants are common, though probably the greater preference is given to ammonia for the reason that the work of compression is less, and these plants have now been developed to a point where the danger from leaking ammonia fumes is negligible. In many installations the main storage refrigerators only are built of cork and concrete and the service boxes are of the portable variety with wood exteriors and interiors. No consideration should be given to any refrigerator that is not insulated with sheet corkboard and of sufficient thickness to insure low temperatures.

The most important part of the cooking equipment is naturally the range, and a wide variation occurs as to the preferences on this piece of equipment. Only a few years back nothing was used except a coal range in 4-foot sections with a fire and oven in each section and of sufficient length to amply accommodate short-order and table d'hote requirements. In recent years the convenience of gas has entirely revolutionized this condition, and nearly every kitchen today is supplied with gas ranges. The gas ranges belong to two distinct types, one with a series of injecting gas burners across the front and the other having four concentric ring burners for heating the range top. Range ovens are heated by two bar burners per section. There also are commonly used ranges built with a coal fire box but supplied with a gas burner in the fire box. Range tops may be either solid or perforated, but in hotel use little demand is made for other than the solid top.

In addition to gas and coal for fuel, large sections of the country have found oil possible, especially in the far west and southern sections where crude oil may be obtained at a very few cents per gallon. For the use of crude oil a motor and vaporizing burner are necessary. This equipment is required on each section of range and makes a comparatively expensive installation. However, there are now in use, satisfactorily, a large number of gravity feed burners which will only handle kerosene or distillate of a specific gravity of 38 or better, and this type of burner makes use of the principle of cooking the oil to a vaporizing temperature. The cost of operation with these lighter burners runs between the cost of coal and gas, whereas the fuel oil burner is far less expensive to operate with than even the cheaper grades of coal.

With the development of large power stations throughout the country, electric ranges are coming more and more into demand. All classes of electric cooking equipment are now made available by both specialized manufacturers and the large equipment houses serving hotel needs.

A recent development of the electric range is encased with a non-corrosive metal and comes in 4-foot sections similar to standard gas ranges. These ranges have at least four separate heat controls for the top and two for the oven, each control being capable of three different heats. This gives an absolute heat control at all times, which may be rapidly changed as occasion may require, and it offers probably the finest cooking range that can be made. In order for the cost of operation to compare favorably with gas it is necessary that the current cost be not over 2 cents per kilowatt as compared with gas at $1 per 1,000. Such power rates are generally offered by the large companies in the principal cities to induce customers to install this type of equipment.

Broilers (Fig. 8) are generally built for gas, with now and then a preference for charcoal and, as also with ranges, many installations of electric broilers. Most broilers are supplied with heating ovens above, further utilizing the heat of the burners below. Adjacent to these boilers must be a short-order box with all raw foods prepared ready for immediate use. No hotel should be furnished with less than two broilers, one to be used with fish and the other for meats. The entire range section, including broilers and steam tables in front, should be located under a built-in hood with carefully graduated openings and perfectly balanced to insure a uniform change of air at all points. Otherwise the intense heat of the ranges becomes unbearable, and it is impossible to keep people working in front of them.

Next in importance to the range section comes that of vegetable preparation (Fig. 6). Here we find a peeler, generally built with walls and disc of a mixture of concrete and quartz, effecting the peeling by the rapid rotation of the disc throwing the vegetable against the rough side of the cylinder. From the peelers the vegetables are sent in steaming baskets and cooked in sectional steamers, and from the steamer are placed in a mixing machine which mashes and creams them. The steamers are built either of cast iron or (preferably) of heavy boiler plate and are supplied with two or more compartments, each separately trapped and vented to insure no mingling of odors. Live steam is admitted to these compartments for the cooking of the vegetables. Great changes have been made in the construction of this piece of equipment, with the latest introduction of an automatic steamer which turns on the steam when the door is closed, shuts it off

as the door is opened, and brings the vegetables out of the steaming compartment on a movable carriage attached to the door of the steamer. This removes all danger of a scalded operator because of a door opened with the steam still on, and makes the handling of the heavy baskets far easier. Adjusting screws on the hinges of this door take up any possible compression of the gasket, insuring a tight fit at all times.

In this same department are located large stock kettles which range in capacity from 40 to 60 gallons. These may be built either of aluminum, cast iron or copper, retinned. The most expensive on the market today is one made of heavy copper and lined on the inside with a 1-inch thickness of pure block tin which must be put on piece by piece and then turned to smoothness. There also is being introduced at the present time a kettle made of pure nickel which will probably replace all other kettles when made commercially. Copper kettles that are retinned must be taken out and tinned again at intervals of every six months in order to insure safety against verdigris deposits. Aluminum kettles are very satisfactory, because they do not require retinning and they have, to a great extent, replaced copper kettles. Cast-iron kettles are perfectly satisfactory for pot roasting and other preparations which are not affected by the color of the iron, but their appearance is not attractive and consequently they are not popular. All kettles and steamers should be located upon a steel drip-pan made of heavy boiler plate sunk into the floor and provided with waste. Similarly, the kettles should be under a hood connected to the ventilating system to carry away all steam and fumes.

Adjacent to this department belong the pot-washing sinks, which should be made of heavy boiler plate and of ample sizes to carry the heavy utensils of the kitchen. Suitable racks and metal tables should adjoin them to provide proper working space.

Two of the most popular and profitable stations of the kitchen are the garde manger and salad counter, which should be located adjacent to each other and in front of ample service refrigerators. The salad counter should have ample table space back of it to enable multiple orders to be prepared in advance and placed in the refrigerators ready for service. The counters themselves should be refrigerated to insure cold plates for this service. The garde manger counter is supplied from a preparation room in which are located meat choppers, sinks, meat grinders, meat blocks, cutting benches and work tables.

The oyster bar adjoins the cold meat counter and should be built with a rustless metal or slate top provided with openings above an open space where barrels or cans collect the empty shells. An ice box back of the counter should be metal lined and have a series of wire mesh trays, about 4 inches apart, to carry the opened clams and oysters ready to serve. The front of the counter is an insulated crushed ice box with insulated lift cover where the waiters secure in plates the crushed ice for each order.

The pantry counters and pastry counters also belong together, and from here are served all varieties of pastry, ice cream, hot drinks and cold drinks. Here, too, are prepared the breakfast services of toast and eggs, hot cakes and waffles. The equipment which is necessary in addition to serving counters are ample ice cream cabinets, soda fountain, coffee urns and breakfast grill. The coffee urns should be supported on a metal top stand with an enclosed cup warmer below. The construction of the ice cream cabinet should be suitable for mechanical refrigeration. The most satisfactory has a series of brine jackets connected together and of sizes suitable to carry the regulation packing can and brick ice cream containers. The walls should be of metal, and the covers also of heavy metal insulated and made in sections.

Back of or adjacent to the pastry counter is the bake shop. The principal fixture, naturally, is the bake oven, which may be heated either by coal, coke, gas or electricity, but always supplied with tile decks. In recent installations the electric bake oven seems to be preferred because of the perfect control of temperature and the ease of operation. The bake shop is divided into two departments, as a rule, one of which is used for making bread, rolls and biscuits, while the other prepares the pastries, cakes and cookies. The equipment which is essential in a hotel bake shop, in addition to the ovens, consists of work tables, marble-top bakers' table, landing table, dough trough, candy furnace, tilting pastry kettle, mixing machines, proof boxes, a refrigerator and sinks. In the larger places a dough mixer is also provided. In the smaller installations the mixing machine is also used by the vegetable preparation department for mashing and creaming the vegetables, whereas in larger installations a separate mixer for this purpose is purchased.

The dish-washing department (Fig. 7) is also a subject of considerable discussion and wide variation in its treatment. Many standard makes of dish-washers are on the market, all of which belong to the overhead spray variety, or, in other words, the dishes are packed in racks or placed upon conveyers which are carried through the machine, and first soapy water and then rinse water is thrown over them by means of centrifugal pumps or mill-wheel sprays. Nearly all of the larger machines have some means of either conveying the dish rack through on a chain conveyer or carrying the dishes through the machine on a conveyer belt. The best machines are provided with copper jackets mounted upon heavy tanks and carry pairs of centrifugal pumps to force the water through spray arms which revolve or are slotted to throw the water in all directions over the dishes.

Equally important with the selection of the dish-

washer are the size and arrangement of the tables. These tables should surround and adjoin the dishwasher and be made of heavy metal in the form of a shallow sink with sloping edges. These are pitched to drain, the clean dish tables back into the dishwasher and the soiled dish tables through openings into the garbage cans below. If the dish pantry is located where a basement or sub-basement is available, the swill from the dishes is carried down a garbage chute upon a raking pit, where lost silver may be recovered and the garbage then put in cans in a cold room, which prevents all disagreeable odors. A separate machine for silver and glasses or, if not a machine, a separate set of sinks for this purpose, is essential. Placed adjacent to this department is a silver cleaning room provided with a burnishing machine for further cleaning and polishing.

The part of the kitchen exposed to the public rooms consists of the serving counter and dish and silver heaters in the center of the room. As nearly every proprietor is proud of the appearance of his kitchen, the general construction is to have all tops made of heavy gauge metal alloy that is non-corroding and can be highly polished, and with the fronts of all dish heaters made of white porcelain steel held in nickel silver or other nickel alloy facings. Concealed bolting allows these surfaces to be perfectly smooth, with all rivets and bolts unexposed. The interiors of these heaters are planished iron with ample coils beneath the shelves to insure hot dishes at all times. The cold counters for garde manger and salad service are built to match these dish heaters, with the exception that the doors are insulated and drop down instead of being sliding or raised, and also that space for coils at the back is provided.

Where the initial expenditure for this type of construction is too great, the nickel alloy tops are replaced with polished steel and white porcelain with

Range Section of Kitchen in Sheridan Plaza Hotel, Chicago. Note white glass hoods over ranges. Gas fuel

planished iron, and polished steel trim is used in place of the nickel trim. A still further reduction in cost may be made by the use of galvanized iron, painted and finished with angle and band iron trim finished in battleship gray. The counters back of the heaters are made of nickel alloy or polished steel in front of the ranges, and of sectional maple on the opposite side for salad, pantry, pastry and garde manger stations.

All of the tables throughout the kitchen should be made of sectional maple in strips not over 1¼ inches wide, tongued, grooved and rodded together

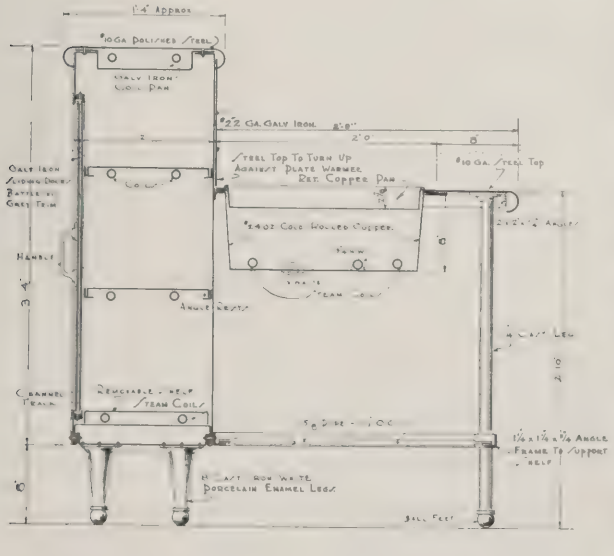


Fig. 9. Cross Section of a Steam Table and Plate Warmer, showing standard construction desirable

Fig. 8. Broilers in the Drake Hotel, Chicago

and mounted upon iron standards. None of the sinks should be made of a gauge less than 14 and as far as possible should be in uniform sections 24 inches square for each compartment, and fitted with separate hot and cold water faucets and large waste openings. In the better installations all exposed sinks are made of non-corroding nickel alloy and fitted with splash backs 12 inches high which conceal all plumbing connections.

The banquet service kitchen should consist primarily of table space with suitable refrigeration and steam table to insure proper service. The steam table should be provided with a series of uniform pans approximately 12 inches square and 12 inches deep set in the center of a wide table facilitating service on both sides. This room should be provided with a battery of urns, a large refrigerator and conveniences for washing the dishes there or for conveying them to the main dish pantry. All available wall and floor space should be utilized for shelving and tables, and the tables themselves supplied with elevated shelves above and wide shelves beneath. Some of the larger hotels add to this equipment broilers and ranges, but as a general rule this is not deemed essential, and the entire food preparation is completed in the main kitchen.

One of the most difficult problems to solve is the sanitary and satisfactory disposal of garbage, and many means have been sought for a satisfactory solution. As described in connection with the dish pantry, a garbage chute leading to a raking pit adjacent to a garbage freezer serves the double purpose of salvaging lost silver and removing immediately from the kitchen all of the odors connected with food refuse from the dish tables. However, this is only possible where a basement or sub-basement is located beneath the dish pantry and relatively close to freight elevators.

Where this is not possible, it becomes necessary to find some other means for garbage disposal, and in addition to the garbage from the dish tables there is refuse from the pantries, poultry rooms, garde manger counter and bake shop, which amounts to a considerable quantity in the course of a day. Incineration is one of the most rapid and complete means of handling this garbage and is generally accomplished by an incinerator located apart from all other equipment with just enough gas burners to supply the flame for igniting the garbage. Owing to the amount of grease which is always present, the heat from burning garbage is terrific, and it is necessary to have a separate flue leading to the highest point of the building and thoroughly insulated from any other part of the structure. Where these precautions have not been taken, disastrous fires have resulted, and if the pipe from the incinerator to the flue is not made very short and of very heavy material the flue will very quickly burn out, and no amount of covering will protect it or surrounding articles from the heat. In the larger hotels this incinerator is built in the form of a brick oven entirely encased with 6 inches or more of fire brick, and this acts as an added protection against the heat.

Much argument has arisen over the relative horsepower required for the operation of various pieces of equipment in kitchens, and, owing to the fact that they are not all used at the same time and that the radiation is extremely different in different locations, it is impossible to do otherwise than approximate the capacity that is required. In figuring the horsepower of boilers these figures may be assumed to be as near the code as possible, or, in other words, a 30-gallon jacket kettle, a 30-gallon coffee urn, 70 lineal feet of enclosed or open ¾-inch pipe and one open jet such as used in sectional steamers are each approximately equivalent to 1 horsepower. If these figures are applied to the various steam tables, coffee urns, steamers, dish heaters, etc., that are required in a 500-room hotel, it will be found that an average of from 20 to 25 horsepower will be required in case all of them are to function at one time. However, as this is seldom the case, two-thirds of the capacity, or from 15 to 20 horsepower, would in most cases be sufficient. The maximum figures given would be ample to apply with a full margin of safety. The minimum average of steam which should be considered at each fixture should be 25 pounds, and the reducing valve should be set at about 35 pounds.

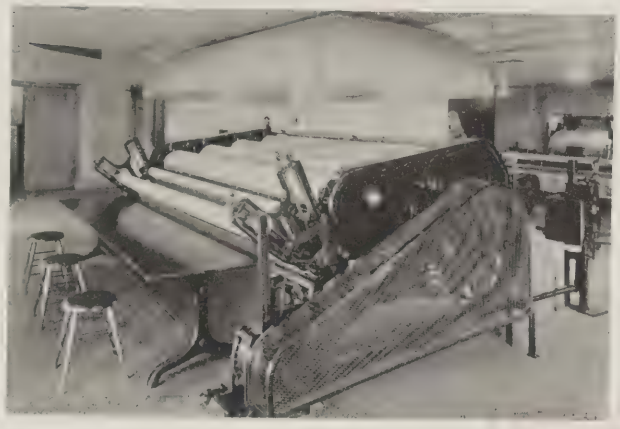
One of the features the importance of which is often under-estimated by contractors and owners in the equipping of a hotel is the amount of hot water which would be required. Where all the equipment is heated by high-pressure steam it is possible to reduce the capacity of the hot water boiler, due to the fact that steam operates with great rapidity and it is even possible to admit to steam tables, coffee urns, etc., cold water and still have it heated with sufficient rapidity not to retard the operation of the kitchen as a whole. Places where hot water is especially needed and used in large quantities are the dish-washing pantry, silver-cleaning pantry, pot sinks, open bain maries and stock kettles. The minimum size of a hot water boiler for a 500-room hotel should be 1,500 gallons, and if the use of the dining room is above the average this should be increased to 2,000. The absence of an adequate hot water supply has caused more dissatisfaction with dishwashing and other cleaning machines than any other one factor, and whereas the larger boiler requires a little additional expense at the start, it is money well spent in the end.

In conclusion, the kitchen floor and walls should receive a word of mention. A resilient composition floor with tile walls is considered by far the most desirable, and wherever possible this construction should be obtained. Where this is not possible, a hard tile floor and hard plaster walls, painted, are the second choice. In any case, the floor should be arranged to permit thorough flushing, and should be provided with drains at intervals to secure easy and quick drainage.

The Hotel Laundry

By JOHN J. PHILLIPS
of Crane-Leslie, Inc., Equipment Specialists and Engineers, New York

AS a purveyor of service, prompt, adequate and efficient, it is wise that the hotel be self-sufficient and not dependent on outside agencies in any phase of its functions. "Foreign entanglements" do not make for "domestic normalcy," whereas proprietary control and supervision of the various operations insure consistently satisfactory results.



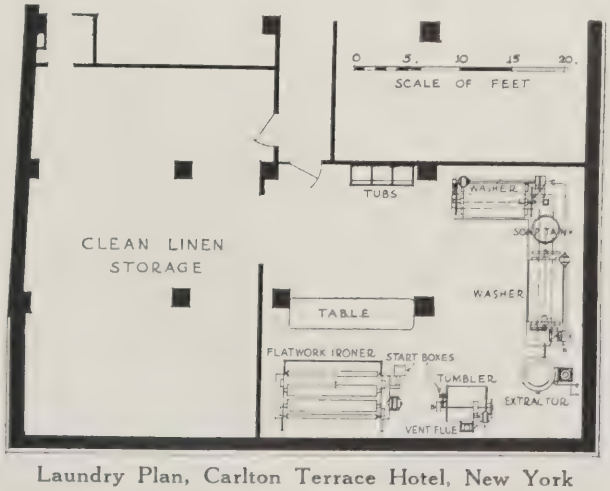
Flat Work Ironer, Wade Park Manor Hotel, Cleveland
Note large exhaust hood

Properly laundered linen is an essential of good service, and it is desirable that this be supplied by the hotel itself. The laundry is now beginning to receive the attention the subject merits, and it is due to the furtherance of education that operation of the laundry by the hotel itself is being recognized as a necessity. Of late there has been some discussion in hotel and other publications bearing on the conditions that should obtain to permit the hotel to profitably install its own plant.

The laundry, properly planned, adequately equipped and efficiently managed, will give satisfactory service, but whether or not the initial investment is warranted from a strictly financial viewpoint depends upon the size of the hotel, or, which is synonymous, the quantity of linen to be laundered. Current performances prove that it need not be larger than 100 rooms, and that for the hotel of 300 rooms or more to assign such work to outside laundries is to suffer a cost very much in excess of that established by private operation. Seven months ago a 500-room hotel in the northwest, with a newly installed plant, wished to determine the exact money saving effected by the laundry in a given period of time. Detailed cost records were maintained to include cost of productive labor, supplies, superintendent's salary and overhead, and such indirect charges as heat, light, power, etc. At the end of seven months the saving was shown to be $7,430, or approximately $13,000 per annum. Particularly satisfactory results have been obtained by a middle-west hotel of 180 rooms and one of 80 rooms in Kansas, both of which report a reduction in costs of 50 per cent. These two instances are cited to indicate the degree of success that can be achieved in this regard by the small hotel, and there are other average cases of record which show conclusively that small installations may be made with profit.

While it is imperative that the investment in plant and machinery yield an adequate return in the form of lower laundry costs, it must be realized that there are other obtainable benefits to be secured by hotel operation. Many managers have learned from experience that only by having complete control over the work will the hotel be enabled to maintain a satisfactory standard of laundering, and be assured a constant supply of snow-white, clean-smelling linen for the guest. Into the establishing of operating costs the preservation of the linen stock enters as a controlling factor. It does not seem logical to take for granted the fact that the outside laundry can give the same personally supervised laundering, so necessary to the long life of the linen, as is assured when the work is performed under the watchful eye of the hotel superintendent, who is directly responsible to the hotel manager for material fluctuations in stock. Especially where the hotel uses large quantities of linen, it is vital that the utmost care be expended to prevent waste and destruction.

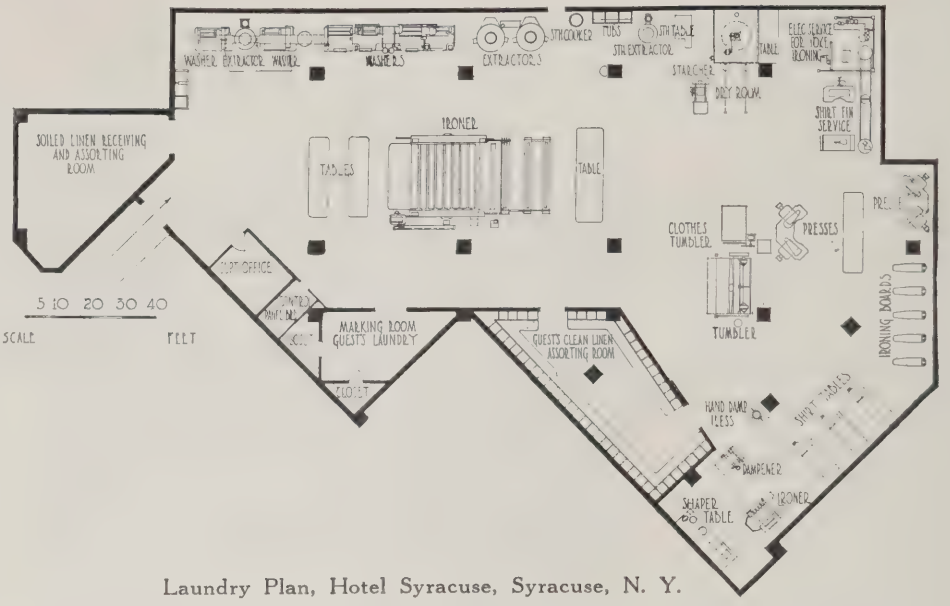
A great amount of flexibility is required in the management of the modern hotel, and this is particularly true in the case of hotels situated in centers where conventions and gatherings take place. At these times there exists a heavy demand for linen



Laundry Plan, Carlton Terrace Hotel, New York
Charles B. Meyers, Architect

Small plant for flat work only in residential hotel of 245 rooms, divided into 150 apartments and large restaurant

supplies, and it is consequently necessary for the hotel to carry in stock a large enough quantity of linen, or to have means of enabling it to reclaim the linen for use again as needed. Of the two it is less expensive to reclaim the soiled linen and pass it back into circulation in the shortest possible time. With this as an added consideration, laundry equipment has been installed to distinct advantage and is daily proving its efficiency in quickly relaundering linen that would otherwise be withdrawn from use for one or two days at a time. It has been demonstrated also that danger of loss of pieces exists in proportion to the frequency with which linen is removed from the hotel premises. The location of the laundry in the hotel proper does away with these constant petty shrinkages that constantly attend the shifting of large quantities of linen to outside agencies.



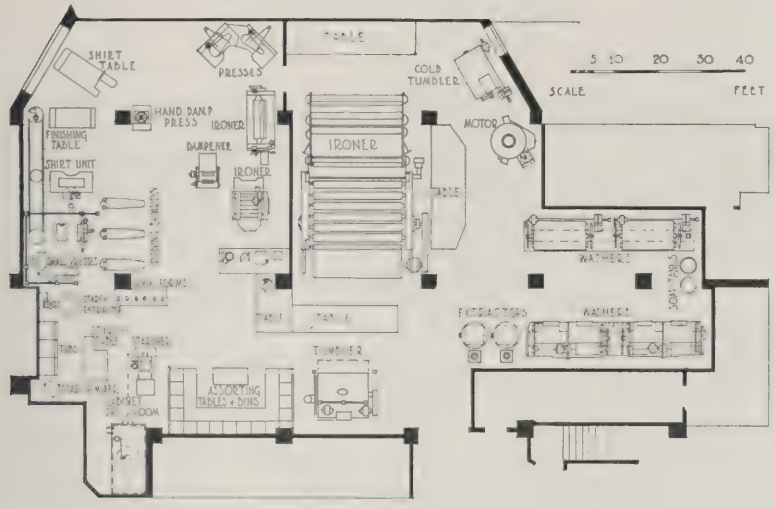
Laundry Plan, Hotel Syracuse, Syracuse, N. Y.
Complete plant with necessary sorting, marking and storage for 600 rooms
Geo. B. Post & Sons, Architects

In addition to taking care of the regular house linen supply many hotels have provided separate departments for the handling of the laundry work of guests, and the installations have made it possible to give one-day service—a convenience found to be appreciated by patrons, and aiding the hotel to fulfill its function of giving ideal service. Practically every hotel having over 500 rooms can develop a guest work department that will be at least self-supporting. By adopting the necessary measures to inform the guest that there is to be had for the asking a prompt and high class service of this nature, the department can be made to not only pay for the laundering of flat work or house linen, but to produce a reasonable profit as well. To secure a bona fide record of performance in this connection, one of the large Statler hotels was visited. It was found that a very satisfactory income is derived from the guest work department,—enough to pay for all productive labor and the superintendent's salary. The prices charged are reasonable, being only slightly in excess of the commerical rates obtaining in that city. Some very satisfying results have been achieved by hotels having a seasonal business—summer or winter resorts—in places where good laundry service is not in the majority of instances available.

In proportion to the increasingly recognized importance of the laundry the understanding is now being brought to the fore that as much care and expert attention should be employed in locating, planning and equipping the laundry as is usually devoted to other not more important departments in the hotel. In the past it has been the general policy to relegate the laundry to whatever space remained after all other departments had been satisfactorily located, and as a consequence many laundries are found to be situated in the most unusual places imaginable, totally inadequate for their needs. The hotel building should be planned to admit of proper and efficient installation and operation of the laundry machinery, and it is requisite that the architect co-operate in seeing that the necessary floor space and ventilation and other equally important details are provided.

Washers and Extractors in Wade Park Manor Laundry, Cleveland. Note exhaust hoods

Hotel laundries are now generally installed in the basements, and it is



Laundry Plan, Hotel Hamilton, New York
Plant to handle guest and flat work in residential hotel and adjoining apartment house. Capacity, 1400 rooms divided into 400 apartments

Schwartz & Gross, Architects

imperative that an adequate and practical system of ventilation be employed. The laundry at its best is a steamy, odorous, hot department, and large exhaust vents should be so located that the air may be changed every few moments. Where possible metal hoods should be placed over washers, tumblers, and flat work ironers, as these machines discharge a great deal of steam which can thus be carried off direct without traveling through the entire room before reaching exhaust outlets. In addition to providing a well-ventilated room careful attention must be paid to the illumination of the department. Individual electric light should be furnished for each machine, and the general lighting system be none but the best. Matters are very much improved in this direction by having painted walls and ceilings of white. Where possible seats for female employes should be supplied. To secure a high grade of performance from employes it is necessary not only to provide the proper machinery and tools, but that the conditions and surroundings in which they work be made as cheerful and comfortable as possible. Any measures adopted towards this end will be sure to yield on the owner's investment a 100 per cent return in the form of an increased quantity and higher quality of output.

The removal of soiled linen to the laundry is best accomplished by means of chutes having openings on each floor. These chutes, into which the pieces are dropped, deposit them as near to the washer machines as practical. A separation is then made for each class of linen—sheets, towels, napkins, etc. If chutes are not available, the linen can be conveyed to the laundry in basket trucks and by elevators, but chutes mean less handling.

In planning the layout of the laundry, machines should be placed so that they will preserve the correct sequence of operations and permit the linen to pass through the various processes without waste motion. In this same connection it is advisable, in order to prevent any hindrance or confusion, to utilize more than one method of ingress and exit and to arrange to have the linen enter the laundry room at one end and pass out through the other. After the linen is sorted and classified it is placed in the washer machines and then passed to the extractors where surplus water is removed. Heavy bath towels next go to the tumbler and thence out. All other articles of flat work proceed to either the shakeout tumbler or the flat work ironer direct. The ironing finished, the linen leaves the laundry proper and is received into the storage room close by, and is now available for requisition. In order to maintain a proper division in these two different classes of laundering it is recommended that the guest work department be separated from the regular flat work or house linen division.

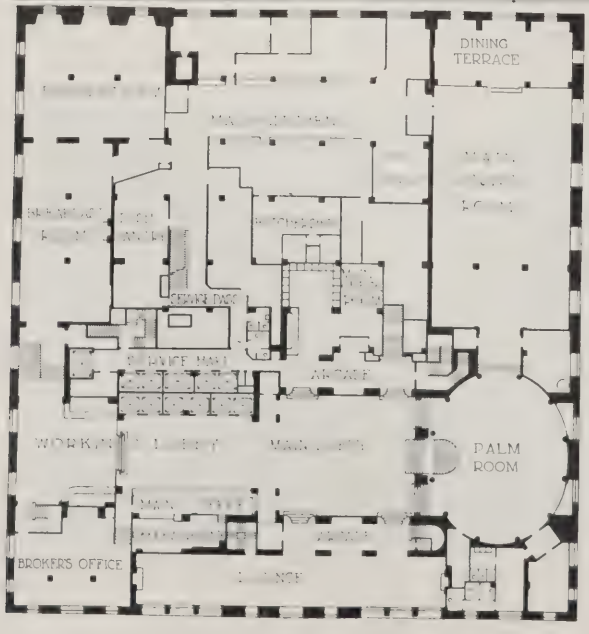
Plans of laundry departments given here show several recent representative installations. In addition to the space occupied by the laundry proper it has been found advisable to have a small room for the receiving and sorting of soiled linen, also another separate room, provided with the necessary bins, shelves, etc., which is employed for storage of the linen after it has been laundered.

At least 100 pounds steam pressure at the boiler is required for the laundry. Flat work ironers, pressers, tumblers and collar equipment of the guest work department produce best results on 80 to 100 pounds pressure. The return steam from these machines can be used in the heating system.

Washers in Hotel Pennsylvania, New York
Shows close spacing possible in restricted area

The Roosevelt Hotel, New York

GEO. B. POST & SONS, Architects



THE Roosevelt Hotel is now being built in New York, and both in its design and construction it is unique among large metropolitan hotels. It is located in the Grand Central zone, and a large portion of it is built over the incoming tracks of the Grand Central Terminal. The handling of foundations and erection of the steel framework without disturbance to the railroad traffic, and the excavation and construction of the extra sub-basements at the front of the building to offset the space occupied by the tracks, constituted engineering problems of considerable magnitude. There will be direct connection by underground passage with the station.

The building is interesting from a plan standpoint in the large proportion of store space that has been incorporated on the ground floor without any sacrifice in the disposition of the public rooms. The relation of the various public rooms, including the ball room, to the lobby floor, is in accord with mod-

ern metropolitan requirements and, arranged on various levels, the ensemble will present an interior of great distinction and charm.

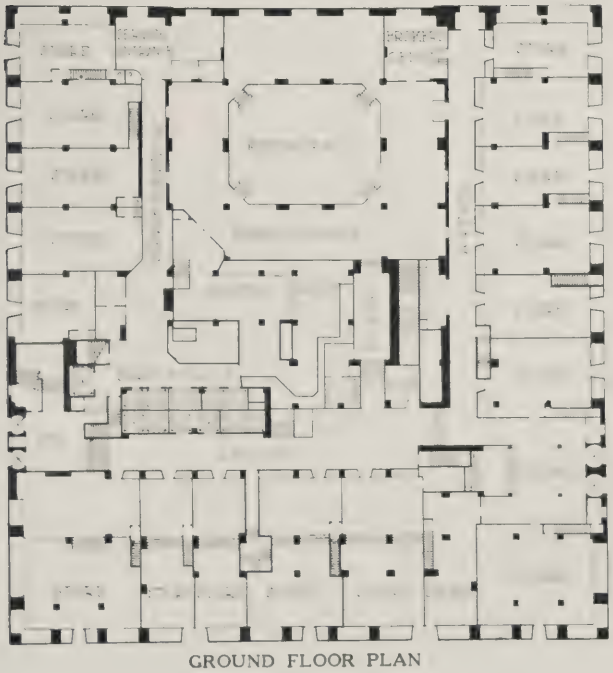
Among the new features incorporated in the Roosevelt is an emergency battery of small rooms for the convenience of applicants for rooms who cannot at the moment be accommodated with permanent rooms. These rooms, numbering 47, will be connected with the Turkish bath equipment on the fourth floor of the hotel. There is also a large dormitory for overnight patrons of the baths.

A second feature is the children's room, to be called the "Teddy Bear Cave." This is placed on the 15th floor and opens on the roof formed by the setback at this level. It will afford both interior and exterior accommodation for children of the guests and visitors. Another feature, introduced through the desire to attain complete service, is a kennel for pet dogs of the guests. It is on the 19th floor and will have an open-air run on the roof.

Still another desirable and perhaps original feature in American hotels is a large number of guest rooms which have the advantage of private roof gardens. These rooms, numbering about 150, are on the two setback floors, and they will be assigned to permanent guests. The roof plots will be separated by lattice work, and each room will have access to its roof space through a French window.

SECOND FLOOR PLAN

TYPICAL FLOOR PLAN



GROUND FLOOR PLAN

MEZZANINE FLOOR PLAN

Service and Administration Requirements

By HORACE LELAND WIGGINS

Vice-president and Managing Director, United Hotels Company of America

SERVICE and Administration Requirements of Hotels" is a subject more suitable for a book than for a short article. For one thing, it is as varied in its scope as are the character and size and number of hotels. There are certain fundamental principles, of course, which apply to all hotels, or rather, to give it an even broader application, to any place where a guest is entertained for a consideration.

One of these fundamental principles—perhaps I might say *the* fundamental principle—is satisfying service. Service depends upon two main factors,—mechanical and personal. Of the two, by far the more important is personal service. By the very nature of the business, the man is always more important than the machine. Its essence is hospitality; and no matter how ingenious an elevator system may be, you cannot get a handshake out of it.

The subject "Service and Administration Requirements" suggests, however, a discussion not so much from a viewpoint of the guest as from the viewpoint of those who are interested in the operation of hotels as a business. There was a time, of course, when administration and the direction of service were not so important as they are today. In the ancient inn, where one man and his wife usually "ran the show," there was no problem of executive direction. It all rested under one hat,—whether the man's or the woman's. But with the alteration in character and development of hotels, through the various stages up to this time, when we have not only one hotel to consider but a large number of hotels, all inter-related and directed from a single executive headquarters, then the questions of service and administration become important.

In our United Hotels Company organization we are finding it more and more essential, in all branches of the hotel work, to departmentalize with efficient and experienced men and women at the head of each department. My personal field is hotel operation, and my work keeps me so busy that I find it rather difficult to find time even to tell anything about it. Even now I am faced with such a multiplicity of details on the subject that I must confess to a certain sense of bewilderment. There is, for example, the question of "planning required for the proper organization, supervision and housing of hotel employes." To an outsider, possibly, that factor might appear important, but nowadays, as the hotel business has developed, there are a dozen other factors that are even more important. More and more, the tendency of practical hotel men is to reduce to a minimum the number of employes who must, of necessity, be housed in the hotel proper. With hotels costing $4,000 a room to erect, it will be obvious even to those who are not bothered with the problem of balancing the ledger that no large portion of the hotel space can be given for the housing of employes. As a matter of fact, in these days, in a large metropolitan hotel the only provision made for accommodations for employes is in respect to the housekeeper and a small part of her crew,—a half-dozen or a dozen will suffice for all purposes. It is necessary to have the housekeeper or her assistant, with some competent help, available at all hours of the day and night in the event of sudden changes or emergency calls. Then, too, there should be accommodations for a force of scrub girls, who begin their work late at night and should be ready for emergency calls during the day. Add to these three or four practical housemen to do the rough work, and you have met all practical requirements. Such employes as are housed within the hotel, must of course be comfortably provided for. I do not favor dormitory sleeping. Experience has shown that the ideal number of women to a room, for example, is three; not two or four, but exactly three. We find that three get along better than four and better than two. If two have a rumpus, the third is there to suppress it. There is quite an interesting little story in the psychology of the number of persons who can get along together most happily in one room. Of course there must be the proper provisions for toilet and bath and for recreation,—one large general sitting room with reading material, phonograph, comfortable chairs, etc. Naturally, the rooms must be airy and inviting; in fact anything less than that could not be tolerated in a large, modern hotel structure, whether for guests or for help. The dormitory idea also is too easily suggestive of jollification parties, which should be discouraged.

Of course in planning for servants' quarters the least desirable section of the hotel space is logically selected—some section which is near the freight and service elevators so that the servants will not have to pass through the guests' hallways. Each of the servants should have a locker furnished with an individual padlock, purchased from the hotel by the servant at wholesale price. The timekeeper has one key, the employe the other, which makes it unnecessary to pry open the lock when a key is lost.

Policies regarding the feeding of hotel help differ with various hotels. It is coming to be a general practice, however, to supply food to those employes only who are connected with the preparation and serving of food in the hotels.

Dining provisions for this help are best provided by a cafeteria arrangement located conveniently to the service department. Separate rooms should be

provided adjacent to the cafeteria counter to accommodate each class of employes. That is, one for women, one for men, and one for the officers, and where colored waiters are employed, a separate room should be provided for them. In determining the sizes of these rooms it is safe to figure that only one-third of all the employes to be fed are to be seated at one time.

The help should be given access to the hotel through a rear entrance, which should preferably be separated from the entrance through which supplies to the hotel kitchen are delivered. At this entrance should be a timekeeper, preferably enclosed so that he is protected against drafts in cold weather, who will check every person's entrance and departure, and to see that nothing is carried out of the hotel. Toilet rooms for the help should be located throughout the building in convenient relation to the working parts. Showers also should be provided adjacent to the locker rooms. In hotels where a large number of female resident help are employed, it is the custom to provide a special help's laundry in which the women can do their laundry work. The number of employes approximately required to operate hotels, may be estimated in the proportion of 80 employes to every hundred rooms.

The various departments of hotel operation are more or less familiar to everybody,—office force, housekeeper, laundry, and the superintendent of building, under whose direction come the painters, carpenters and upholsterers; the engineer with his electricians, plumbers, steamfitters and firemen; maitre d'hotel with his dining room crew; the chef, with all employes who are concerned with the preparation of food; the steward and his crew, who look after the matter of raw food; the porter and his assistants; the head bellman and his crew, and in the very large hotels, the floor clerks. Then we have the hotel valet and the various departments which might be put under the head of "concessions," such as cigar stands, coat rooms, checking rooms, stenographers, taxi service, theater ticket agencies, newsstand, flower shop, etc.

In these modern times, as I have said, very few of these employes must be accommodated with sleeping quarters inside the hotel. All that is necessary is only to "man the ship" day and night and to be ready for emergencies. As the modern hotel runs for a greater part of the 24 hours, it is obvious that there is no necessity for making provisions such as they have at firehouses and police stations; nobody has to "slide down the pole" to respond to the alarm, so to speak.

I have frequently been asked if there is any proportionate decrease in the number of employes required with the development of mechanical apparatus in hotel operation. I say no. In the old days one man could grind out enough ice cream to serve all the guests in the place. Now we make ice cream by machinery, but the machinery has to be taken care of, the ice cream has to be served and the additional dishes have to be washed, and the cashiers have to make change and the bookkeepers have to keep track of the cashiers' accounts, and bills have to be paid and, finally, about the only saving factor in the whole situation is that the modern hotel man does not have so much difficulty getting his profits to the bank, because, proportionately, the profits are about the only things which have not kept pace with the increased business.

If the modern hotel operator did not keep constantly in mind the problem of keeping the payroll down, there would be still less profit, of course. In the old days the cashier in the front office usually could take care of the checks from the restaurant. Nowadays, with two or more restaurants of various kinds running, separate crews are required. A saving may be effected by intelligent planning of the various departments. I recently heard of a case which illustrates my point. A certain hotel has both a grill room and a coffee room, separated by only a wall. The original plans would make necessary the employment of two cashiers. By cutting a hole in the wall, the checks from both departments could be taken care of by one cashier. Assuming that there are two crews of cashiers, each cashier being paid $50 a month, by this simple expedient of cutting a hole in the wall, they save $100 a month, or $1,200 a year, the interest on an investment of $12,000.

In planning the service portions of the hotel architects should keep constantly in mind that too much study cannot be given to the economical arrangement of the various working parts. Every cubic foot of construction has to be paid for, and if wasteful use of space occurs it places a serious drain on overhead costs. A thorough study of the work involved in serving food in restaurants and its preparation in the kitchen will help architects to visualize the problem, and I would further recommend that they make a study of steamboat and dining car construction as examples of efficient service in restricted working spaces. The kitchen and service rooms should be arranged to have the utmost convenience and should also be as compact as possible. Convenience does not mean using excessive space, and in the smaller hotels particularly the layout should be arranged with the idea of one man's covering more than one station. The kitchen, whenever possible, should be located on the same floor and adjacent to the dining room with the largest seating capacity.

The laundry in a hotel is important, and an entire article would be required to cover the subject in a thorough way. I will, therefore, confine myself to generalities. Unless a hotel has 500 rooms or more, it will rarely pay to do what is known as bundle work—that is, shirts, collars and personal linen, sent in by the guests of the hotel. With less than 500 rooms, this class of work can be more profitably be sent out, and the flat work—sheets, towels, napkins, tablecloths, etc.—only be done in the hotel laundry. On account of weight of machinery, and

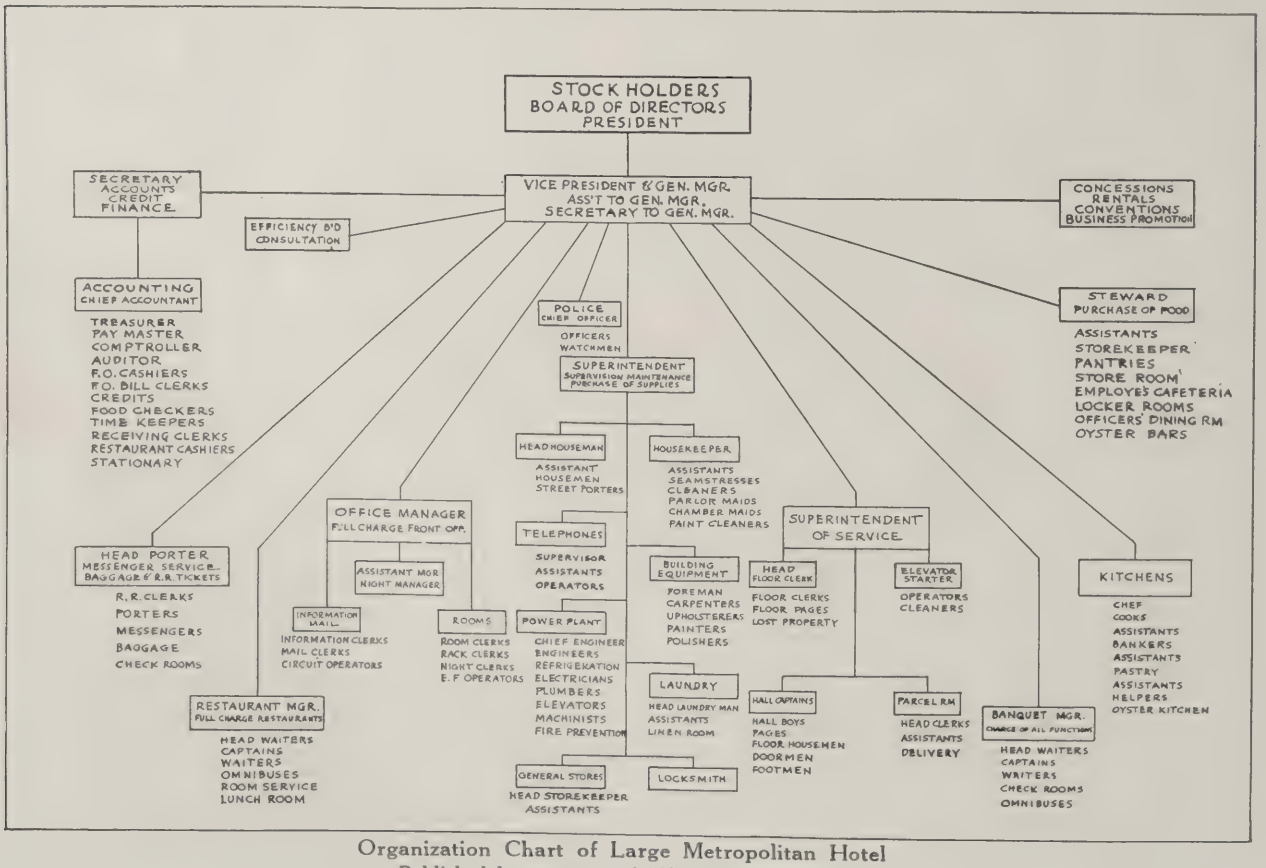
noise and vibration when it is in operation, as well as the danger of water overflow, it is best to locate the laundry in the basement, taking care to have the space used for this purpose well ventilated by intake and exhaust air fans. A hotel should without question do its own flat work. It is inconvenient to send this class of work out. Not only do linens last longer when done in a well conducted hotel laundry, but the danger of loss of articles, which often occurs in sending them out of the hotel for laundering, is thus avoided.

Some mention might be made of instances where extravagance in the use of working space may creep in. Room service is an element where excess facilities are frequently provided. In hotels of 400 guest rooms and under, this service should be supplied directly from the main kitchen by means of easily accessible elevators. In hotels of 1,000 or more guest rooms, serving pantries on alternate guest room floors will be required. The fact that each of these pantries must be manned by two men, one to take orders and the other to distribute them, indicates the losses that would accrue from extravagance in this phase of hotel service.

Among other details of plan that contribute to good service with fewer employes the linen supply rooms may be mentioned. The main supply of linen should be located as near the center of the building as possible and in close proximity to the service elevator. In a ten-floor hotel it will be most convenient to have it on the fifth floor; it should be located so that it can have natural light for the seamstresses who work there; also a room should be provided near by to take care of surplus linen, the normal supply being kept on open shelves. In addition to this central room there should be a linen closet on each floor, also centrally located. The maids receive each day the supply of linen that they will require for the floor, and it is kept here until needed. On every guest room floor there should be ample closet space to take care of the storage of cots, cleaning utensils and other items.

In general, the problem of planning for easy administration should be approached in much the same manner that a manufacturer determines the layout of machinery in a factory. Effort should constantly be made to reduce the amount of travel between necessary points to the minimum.

As said already, a basic test of the efficiency of a hotel plan from the standpoint of profitable operation is the amount of cubic footage it contains in comparison with the number of guests the building will accommodate. As a guide for determining the effectiveness of a plan from this standpoint, I would say that a carefully planned hotel of 200 guest rooms should not exceed in contents 1,000,000 cubic feet, exclusive of space devoted to stores and such other features for which a definite rent, returning a profit, is charged. It might be said that very few hotels meet this test, but it will serve to prove the necessity of limiting the amount of building volume to the minimum consistent with good planning.



Organization Chart of Large Metropolitan Hotel
Published by courtesy of "Hotel Management"

Photos, Paul J. Weber

MOUNT ROYAL HOTEL, MONTREAL

ROSS & MACDONALD, ARCHITECTS

GROUND FLOOR PLAN

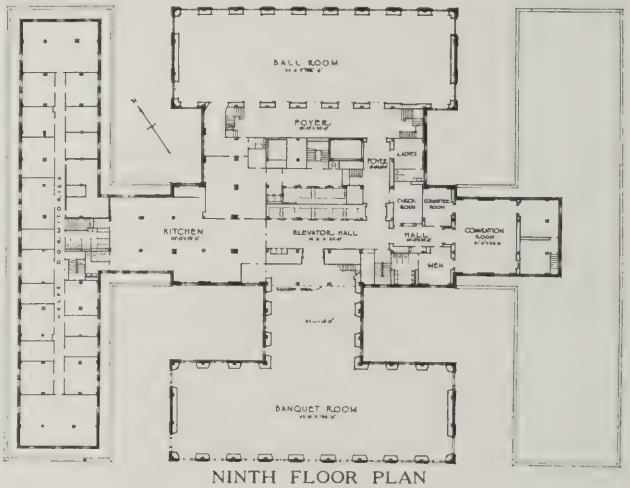
MOUNT ROYAL HOTEL, MONTREAL

Illustrations on Plates 85-88

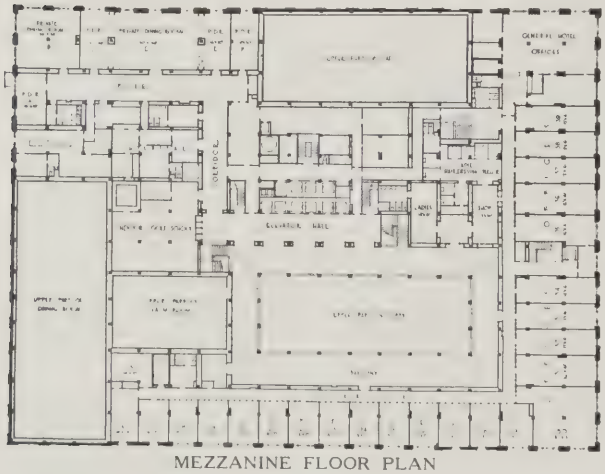
This is the largest hotel in the British Empire, and has been designed to meet the demands of tourists, traveling men and conventions. The building contains 1,046 guest rooms, each provided with private bath. The dining facilities are especially ample.

The building contains 9,000,000 cubic feet, and the cost, including land and necessary financing arrangements, approximated $10,000,000. Construction was begun September 9, 1921, and completed December 20, 1922. The exterior materials are granite and buff cast cement with light buff brick for the main walls.

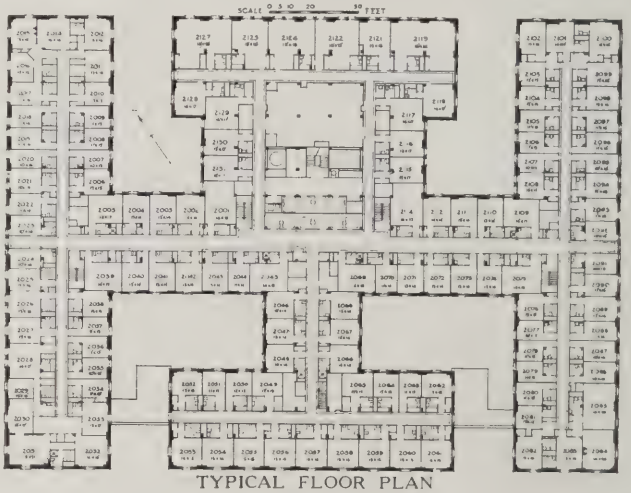
Heating is by an exhaust or low-pressure steam vacuum system controlled by thermostats. The mechanical equipment includes a laundry for both flat work and guests' service; a two-unit refrigeration plant, each unit of 35 tons capacity; ventilation for all public and principal service departments, comprising 11 supply fans and 14 exhaust fans; and a complete pneumatic tube installation. Provision is made so that electrical current may be purchased or generated in the building. The boiler plant consists of two 400-h.p. and two 300-h.p. water tube boilers, designed for 165 pounds pressure.



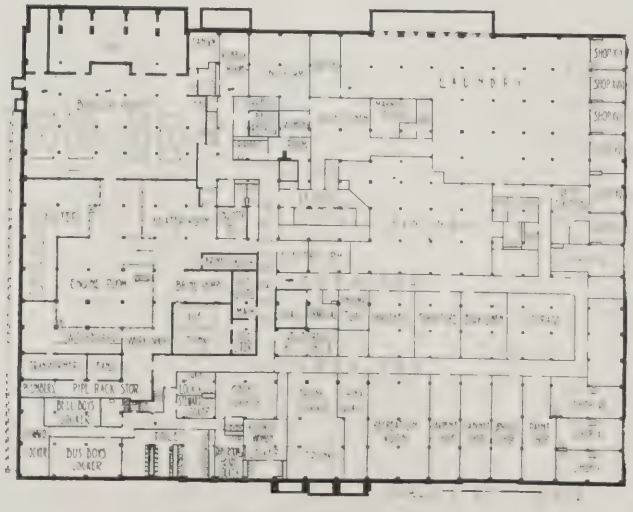
NINTH FLOOR PLAN



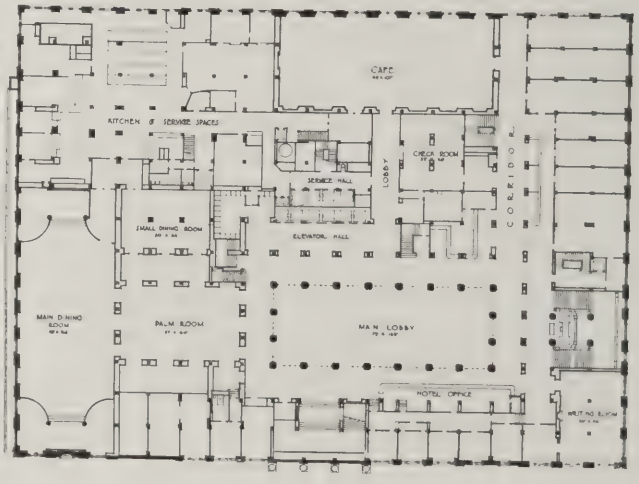
MEZZANINE FLOOR PLAN



TYPICAL FLOOR PLAN



BASEMENT FLOOR PLAN



FIRST FLOOR PLAN

MAIN ENTRANCE LOBBY

VIEW ACROSS MAIN LOBBY

MOUNT ROYAL HOTEL, MONTREAL

ROSS & MACDONALD, ARCHITECTS

DETAIL AT END OF MAIN DINING ROOM
MOUNT ROYAL HOTEL, MONTREAL
ROSS & MACDONALD, ARCHITECTS

PALM ROOM

GRILL ROOM

MOUNT ROYAL HOTEL, MONTREAL

ROSS & MACDONALD, ARCHITECTS

GENERAL EXTERIOR VIEW

DETAIL OF ENTRANCE

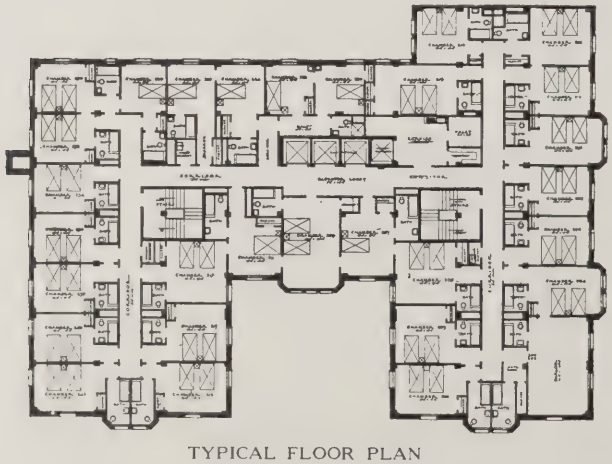
HOTEL HAMILTON, WASHINGTON, D. C.
J. H. DE SIBOUR, ARCHITECT

HOTEL HAMILTON, WASHINGTON

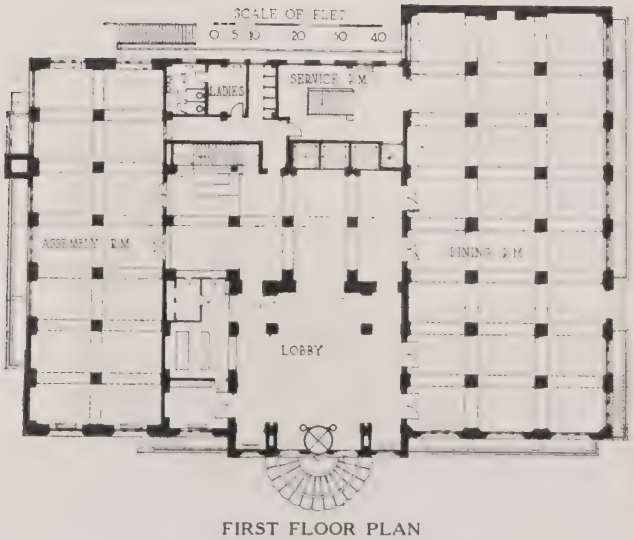
Illustrations on Plates 89 and 90

The Hotel Hamilton has been designed to afford distinctive service in Washington. It contains 350 guest rooms, each with private bath. The main dining room seats 400, and there are in addition three private dining rooms seating 60 each. There is one main kitchen, a service kitchen for each private dining room, and a service pantry on each floor.

Construction is steel frame with reinforced concrete floors; exterior materials, Indiana limestone and terra cotta. The interior is executed in plaster in Adam style. Heating is by low-pressure steam vapor system; power from central station. Mechanical equipment includes 36,000 cubic feet ventilation for kitchen, etc.; 12,000 cubic feet air washing for public rooms, 7½-ton refrigerating plant, and portable vacuum cleaning system. Total contents of building is 1,450,000 cubic feet; completed December, 1922.



TYPICAL FLOOR PLAN



FIRST FLOOR PLAN

SECOND FLOOR PLAN

LOBBY

MAIN DINING ROOM

HOTEL HAMILTON, WASHINGTON, D. C.

J. H. DE SIBOUR, ARCHITECT

The Architect's Business Contact with Hotel Projects

By C. STANLEY TAYLOR

A COMMISSION to an architect to design a new hotel may be received from any one of four sources. Such commissions divide themselves into four classes; presented in order of experience these are:

1. Projects which are brought to the office directly by clients, or through their recommendation.
2. Projects brought to the architect by promoters, in the preliminary stages of which the architect is asked to co-operate.
3. Projects subject to competition or direct sales effort on the part of the architect.
4. Projects which from a business viewpoint originate in the architect's office.

Two of these sources of hotel work in the architect's office are interesting in that a method of procedure is involved different from that to which the architect is usually accustomed. The first of these is working with promoters of hotel projects. It is said in hotel circles that only about 5 per cent of hotel promotions which are undertaken ever reach the stage of construction. The first step which the promoter of a hotel enterprise takes is usually securing an option on the proposed site and a tentative plan of the proposed building with perspective sketches for publicity and sales literature. Naturally, the promoter will endeavor to obtain this material from an architect on a gambling basis, toward which the architect must devote a certain amount of his time and knowledge to creating the most favorable basis for leasing and selling bonds or stock for the financing of the project in hand. This creates a situation in the consideration of which the architect cannot afford to be arbitrary. He cannot gamble with every suggested promotion, nor can he consistently turn down all such propositions which may be suggested to him.

The proper procedure is a careful investigation as to the antecedents of the promoters and the logic of their enterprise:

Who wants the hotel?

Is the community behind it?

Has some of the equity financing been provided?

Have these promoters ever put through a similar proposition?

Is the site a logical one?

Is there a definite community need for such a building?

These and similar basic questions are those which the architect should ask himself, the promoters and the leaders in the community before he commits himself to any program wherein he is called upon to invest actual money and valuable time on a contingent fee basis. His part in hotel promotion should be undertaken very seriously. It is not sufficient to dash off an approximate plan and sketch. If the enterprise is really to be brought to a successful conclusion, careful study should be made with a realization that plans and outline specifications will almost immediately be submitted to a mortgage company for a building and permanent mortgage and then to the investing public as a basis for the sale of bonds and stock. They will also be submitted to logical lessees or to a newly formed operating company for the determination of approximate rentals. Also, where rentable space in the form of sub-leases is provided, the plans will be submitted to business men who may be interested in operating the shops and concessions.

Thus the preliminary plans receive the consideration of a number of experienced and practical hotel operators, mortgage financiers, realty experts and the business men of the community. If the plans do not provide for a logical investment and a proper return, the venture will fail at that point, and the responsibility will lie primarily with the architect. On the other hand, these preliminary plans if properly developed may serve to insure the successful passing of the promotion stage.

Similarly, it is quite possible for the original idea of a hotel project to first develop in the architect's office and be presented by the architect to a professional hotel promoter, to the local chamber of commerce or to local real estate interests. The most logical development by the architect of an original hotel investment idea is the presentation of such a suggestion to the owner of an important undeveloped building site. A number of hotel projects owe their origin to this form of constructive imagination on the part of architects or members of their organizations.

Another business contact which the architect should seek to develop or which should be accepted and maintained in an understanding spirit is his relationship with large mortgage financing organizations, particularly the underwriters of bond issues. Here it will be found that all contracts for the financing of hotel projects carry a clause which permits the underwriter to have full and final approval of the plans and specifications of the building. As soon as an architect knows that the owner is negotiating with such an underwriter or has closed a financing contract of this nature, an offer of close co-operation in planning under the supervision of the underwriter's service department or consulting architect should be forthcoming from the original architect on the project. This form of co-operation will be appreciated and, without mincing matters, it may be said that if it is not forthcoming it will be forced. It is a great mistake for architects to hold themselves aloof from various important business considerations involved in the development of a

hotel project, and it is similarly a mistake for an owner to withhold from the architect his confidence regarding the financing of the operation.

It may be said that in addition to the requirements of good architectural design, which are established for any important building of an institutional or public service nature, the hotel project is highly complicated by the fact that it is primarily a problem of investment in which every element of planning, construction and equipment has a direct bearing on its ultimate success from a business viewpoint. There is probably no type of building which demands from the architect such comprehensive knowledge and study in order that he may create plans affording at once architectural excellence, a minimum cost of first investment, the highest earning power and the lowest maintenance cost consistent with the established management policy.

The average hotel project, regardless of its location, is subject to certain primary considerations and logical business tests which may predicate success or failure from the investment viewpoint. These factors are considered in detail in another article in this issue (The Economics of the Hotel Project), but it may be said in general that the purchase price of the land must bear a sound ratio to the cost of the building which is to be constructed; that through the medium of room rentals, concessions and other income-earning activities there must be established an unquestionable gross income which in turn indicates the amount of money which can be expended for land and building; and that the hotel must be deliberately planned to meet carefully analyzed requirements, not only of the traveling public but for the accommodation of local activities and interests.

In the preliminary consideration of plans for a new hotel, it is well to think of the building as a new machine designed for a very definite type of production which in turn must be sold to the public. In the construction and equipment of this machine there must be no part which does not *work* and so add its quota to the earning power. The production expected from the operation of this machine is *satisfactory service to the public*. Each part must be so geared up that the result will be smooth operation at the lowest consistent operating cost. There must be no weak parts which within a few years will require costly replacements and contribute to high maintenance costs.

It will be argued immediately that the architect cannot usually be expected to maintain within his own organization the business and engineering knowledge and experience necessary for the complete development of a project of this nature. This is quite true, and one of the first demands of the architect who would undertake a hotel project is that he understand the importance of bringing in experienced consultants who will co-operate with him to insure the success of his plans. The important elements of consulting service which should be considered include the close co-operation and supervision of planning by a practical management organization or an individual thoroughly familiar with the operation of a hotel of the type under consideration. This consulting service will in many instances be available through the owner, who himself may be a practical hotel man or who may have an operating organization. If this is not the case the importance of arranging with the owner to appoint his manager before plans are drawn cannot be too strongly emphasized, or if this cannot be done an expert in the organization and management of hotel projects should be brought in on a fee basis.

The complex problems of mechanical equipment and special equipment such as that of kitchens and laundries should also be placed in the hands of consulting engineers unless the experience of the architect's own organization is such that these phases of planning and equipment can be handled successfully and on an economical basis. It is, of course, to be remembered that many manufacturers of special equipment of a mechanical or service nature have engineering departments highly skilled in laying out installations which come under this heading. In many instances this service is of so complete a nature that from the architect's viewpoint it is highly dependable and serves to relieve him of much detail responsibility.

Perhaps it may be suggested that the determining point in this consideration might be established by the amount of money which is to be invested in the particular installation in question and by the complexity of the installation problem. The consulting engineer is naturally unbiased and seeks primarily to solve the problem of equipment and its installation in a manner at once economical but insuring dependable service, long life and low maintenance cost.

Similar problems arise in connection with interior decoration and furnishing, and conditions similar to those of mechanical and service equipment installations may be said to exist. Many architects' offices are thoroughly organized and equipped with knowledge to carry out the complete decorative and furnishing scheme. This, of course, involves much detail, and it is generally found more satisfactory to employ professional interior decorators who will work in harmony with the architectural designer, giving joint consideration to the selection of fabrics, furniture, floor coverings and other elements of interior decoration. Again, in this field it will be found that a number of reputable manufacturers maintain experienced service departments ready to co-operate with the architect or to work with both architect and decorator toward the insuring of satisfactory results. In working out the scheme of interior decoration and furnishing, it is of course important that the hotel manager or practical adviser be brought into close conference, particularly in the furnishing of guest rooms and dining rooms. He should also be present at conferences where the equipment of kitchens and other forms of service equipment are finally determined upon.

The Hotel for the Typical American City

By W. L. STODDART, *Architect, New York*

THE backbone of the hotel industry in the United States is formed by the commercial hotel, represented by hundreds of buildings of varying degrees of merit and ranging from 50 to 300 rooms in capacity. The importance of the small hotel in the aggregate may be seen from a recent survey of hotels in this country; of a total of 22,196 hotels, 16,522 are of 50 rooms or less, and 5,046 are of between 50 and 200 rooms.

Today the great majority of smaller hotels are community enterprises. The need for a hotel is felt by the business interests of the city, and through a committee of prominent merchants, manufacturers, etc., backed up by the local chamber of commerce, the problem is undertaken. In the natural course of events, these men are without experience in the hotel owning or operating field, and the most important consideration at the outset is to secure intelligent advice. The most effective and logical thing to do is to bring in at this point the lessee or operator of the hotel. Since it will be largely due to his management whether the hotel is a success or not, it is important to be assured that in its arrangement and equipment his ideas are complied with.

The first point that comes up for decision is the size of the hotel. In this the hotel lessee should be the most capable judge. Supplementing his opinions, it is well to secure the ideas of the outstanding local retail merchants, because they have a direct knowledge of the community's buying power. The business men will also be able to indicate fairly closely the amount of patronage to be expected from commercial travelers. The character of the city will, of course, determine this largely. In an industrial section there will be less patronage of this type than when the community is a trading center. The patronage from the townspeople themselves and the stimulus that a new hotel will provide the city's commercial and social activities should not be overlooked.

The relation of the surrounding country to the city is also an item of importance. If the city is on a main line railroad or if a popular automobile highway passes through it, the hotel can be larger than if the city is not so favorably situated. Given these advantages of location and, with a modern hotel, a city becomes a logical convention center.

It is not wise to draw comparisons between cities of similar populations in determining the capacities of hotels because of the varying local characteristics even in cities of the same size. The existing hotel accommodations in a city should, of course, receive serious consideration. The size of the new hotel should not be affected in any degree by existing hotels unless at least one of them is entirely modern. It is the experience in most cities that a new hotel not only creates business for itself but creates business for all the hotels in town, and it is also generally true that a new hotel is an element of importance in increasing the population of the city.

In determining the size of the hotel, I would make three recommendations. First, it is not a sound financial proposition to build a modern fireproof hotel of less than 150 rooms, since because of the public space required in a hotel of any size it takes this minimum number of rooms to produce sufficient revenue to insure the interest on the investment. Second, it is a safer business proposition to build conservatively and allow for future expansion. It is in the province of the architect to make this provision in his original plans, but he must, of course, be given definite indication from the owner as to the probable future needs. Third, the possibility of store rentals as additional revenue to the hotel owner should be definitely considered and will largely affect the selection of site. This revenue should be equal to the interest on at least 25 per cent of the cost of the building or, in other words, should equal the taxes and interest charges on the property or, if the property is leased, the annual rental charge.

Selecting a site for any hotel is a matter of serious concern, but it is of the greatest importance in the case of a small commercial hotel. There are in general four classes of people whose opinion in regard to the site should be carefully weighed. These are the prospective lessee, the architect with experience in the building of hotels, the city's leading retail merchants, and officials of the chamber of commerce. The particular points that should determine a site are its accessibility to railroad stations, street car lines, automobile highways, the city's business district, and the residential section. If the hotel site is selected with reference to these factors, the question of revenue from sub-rentals will automatically take care of itself.

If the indicated return from store rents can definitely be assured, the cost of the site selected is of secondary importance. The best site should be selected, regardless of cost, and the income from sub-rentals adjusted to carry the cost of the property. The best location for a new hotel is one that is conveniently close to or even directly in the line of growth of the city's retail business and at the same time on the main street leading out toward the residential center. The retail center of a city follows the trend in residential building, and it is better to choose a site with which the business district will catch up than to locate a hotel in the immediate business center with the possibility of its being left

behind in the course of a few years' rapid growth.

Adapting the hotel plan to a city's requirements can be done only after a careful study of the type of hotel service that will be demanded. While it is frequently said that a hotel cannot be called modern unless every room is provided with a private bath, it is obvious that all of the traveling public has not arrived at a point where this is demanded, and the successful commercial hotel should be in a position to meet the demands of a varying patronage. The provision for guest rooms should therefore be sufficiently elastic, so that the commercial traveler who wishes to keep down expenses, the tourist and the attendant at conventions can all be accommodated.

Every room in a hotel should have toilet facilities and a lavatory. The bath can be omitted, but there is no necessity for providing public baths on the typical floors to serve patrons of these rooms. As a matter of actual space utilized there is no gain in providing public baths and toilet rooms for men and women to serve the few rooms on a floor that would not be equipped with private baths. An actual instance of this is seen in the case of remodeling a hotel in a southern city which originally had from 50 to 60 rooms without baths. One hundred thousand dollars was spent in equipping these rooms with private baths, and even with the added space required for bathrooms 14 additional guest rooms were gained. The new arrangement, of course, provided rooms slightly smaller than those originally built, but entirely suitable for modern conditions. Every room in a hotel should also be provided with a closet if possible.

From the standpoint of economy in construction, as many of the floors as possible should be alike. It is, therefore, necessary to plan the typical bedroom floor so that a proper proportion of each of these kinds of rooms will be incorporated. The larger rooms that tourists will require can be located at the corners. The smaller rooms, with possibly lavatories and toilets only, can be located on the courts, and the tiers of typical rooms and baths occupy the street frontages of each floor.

For the typical hotel in a city of 20,000 to 50,000 population, in which the patronage will be chiefly commercial in character, I would recommend these sizes for bedrooms:

Court rooms, 9½ to 11 feet wide by 14 to 15 feet deep.

Rooms on street frontages, 10½ to 12½ feet wide by 16 feet deep.

Corner rooms, 13 to 14 feet wide by 16 feet deep.

A practical ceiling height for a hotel of this character is one that measures 10 feet from floor to floor.

There is an advantage in arranging some of the corner rooms en suite. Tourists frequently demand larger accommodations than do traveling men, and

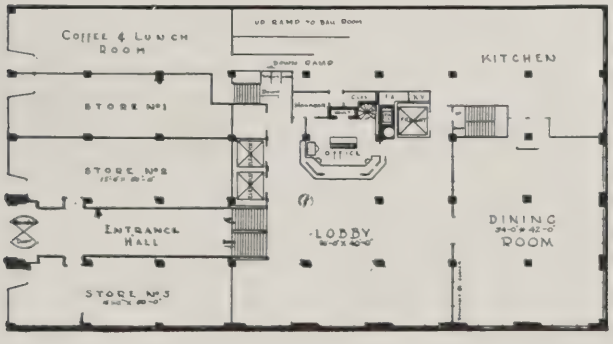
View of Lobby from Ball Room Foyer, Lycoming Hotel, Williamsport, Pa.
The dining room is at far end, screened with glass partitions to make expansion possible
W. L. Stoddart, Architect

Lobby Lounge, Penn Harris Hotel, Harrisburg, Pa.
The dining room is at the far end screened with low plant boxes, and can easily be arranged to meet changed conditions. This is typical of the flexible public space plan
W. L. Stoddart, Architect

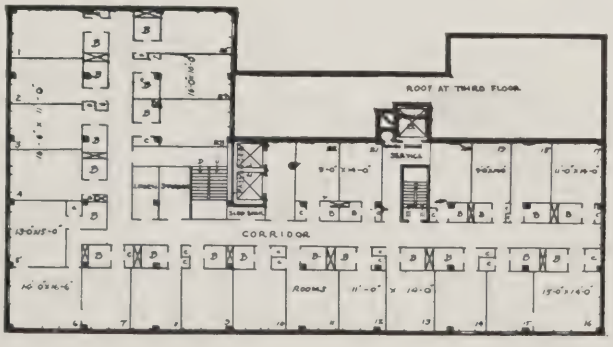
in developing the business of a new hotel such a combination of rooms offers opportunity of securing desirable patronage in the way of winter leases from residents of the city. This business offers the management a steady income until such a time as transient business develops, when these rooms can be used for single occupancy, since a larger percentage of profit is in that type of patronage. The proportion of single and double bedrooms can generally be determined satisfactorily by furnishing all the street front and corner rooms with twin beds and the court rooms with single beds.

A proportion should also be worked out between tub baths and shower baths. There is, unfortunately, an impression among the traveling public that the shower bath represents less expense to the hotel, and there is consequently a demand for shower baths on the part of those persons who economize. As a matter of fact, if the shower bath is properly installed it equals and often exceeds in cost the tub bath, and from the point of operation it is frequently more expensive. To meet this demand 10 to 15 per cent of the court rooms should be equipped with shower baths.

In cities where trade is an important element there will be need for sample rooms to accommodate commercial travelers. It is difficult to gauge the number of these to provide because they will be unoccupied during certain seasons of the year, and they consequently represent a drain on hotel profits. A com-



This typical first floor plan shows a desirable location for the coffee room and convenience of kitchen location



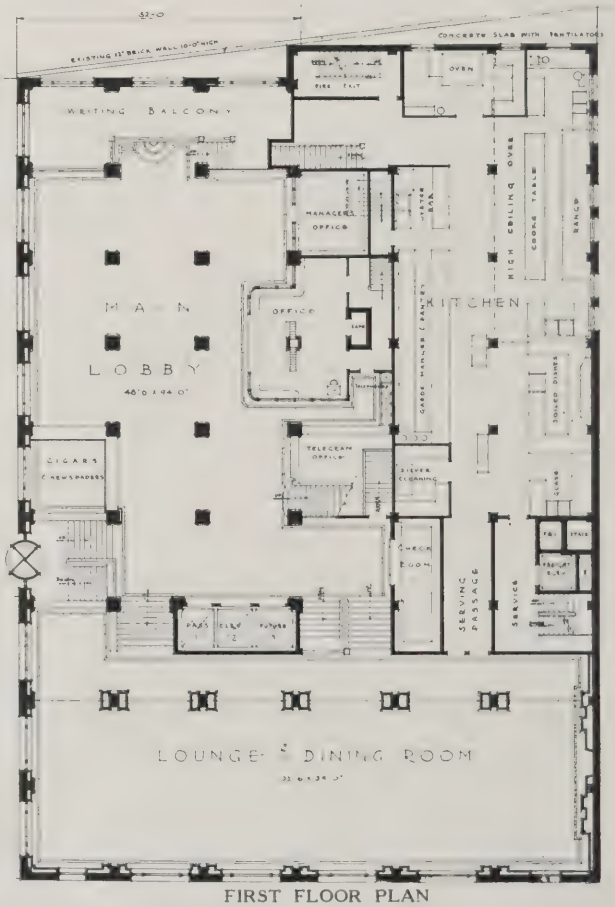
Typical guest room floor to show practical first portion. Future business can be provided for in additional wing at the right

W. L. Stoddart, Architect

SECOND FLOOR PLAN

TYPICAL FLOOR PLAN

GROUND FLOOR PLAN



FIRST FLOOR PLAN

A TYPICAL HOTEL OF 300 ROOMS; THE FRANCIS MARION, CHARLESTON, S. C.

W. L. STODDART, ARCHITECT

promise should therefore be reached by planning them with a view to utilizing them as bedrooms. The type of disappearing bed that folds into a closet is satisfactory equipment for the traveling man, and at the time of conventions and other peak loads the rooms can be furnished as regular guest bedrooms, or else cots can be used. In the small hotel it is probably better to arrange these sample rooms near the service elevator on each floor rather than to provide an entire floor of sample rooms, because of the greater elasticity that the former scheme provides.

Convenience of service should not be overlooked on the typical floor. It is essential to incorporate a slop sink closet, a linen closet for the daily floor requirements and whenever possible storage for cots. Laundry and rubbish chutes will contribute to better service, reduce the number of maids and relieve the elevator.

In planning the public portions of the small hotel every effort should be made to conserve space. The various dining rooms that the type of patronage indicates as necessary should, whenever possible, be so located that they can be served from the main kitchen. The kitchen and main dining room should be placed on the lobby floor level or slightly above it. An important feature of this type of hotel is the lunch room or coffee shop. This should be given the best street front location on the ground floor that is accessible to the kitchen service, and the connection can generally be accomplished by means of a ramp.

Exterior, Francis Marion Hotel, Charleston, S. C.
The lounge lobby extends the entire frontage over the stores
W. L. Stoddart, Architect

The simplest and most logical scheme for meeting the small hotel's need for public space is a large room planned in conjunction with the lobby that can be so screened off as to serve different purposes. When a lot is of such dimensions that a frontage of 100 to 125 feet can be had, a lounge space covering this area, raised a half-story above the lobby and located directly over the street front shops, meets the conditions admirably. One end can be used as a dining room and the other end for a general lounge, and there should be separate staircases from the lobby to each section so that they can be used independently. If the restaurant service increases it is a simple matter to extend the temporary screens to gain the required space. Similarly, the dining space can be contracted so that there will not be an empty appearance as happens when a large separate room is provided and the expected patronage does not develop. With this arrangement, the lobby is in the center of the building and serves simply the commercial end of the hotel, the lounge space providing the social end.

In small hotels, where conventions are not a regular part of the business and the demand for space for them is irregular, this same lobby-lounge can be devoted to entertainment purposes. In this event, a large storeroom on the same floor level is necessary in order to store the furniture that has to be removed from the lounge. In planning the working lobby of the small hotel, certain provision should be made for small concessions, such as cigar stand, newsstand, flower shop, etc., but the rental returns from these spaces are not sufficiently great to require any special attention being given to securing advantageous locations for them.

A determination of space for private dining rooms and a ball room will depend entirely on the business and social activity of the city. At best, the question of installing a ball or assembly room, particularly in the typical hotel of 100 to 200 rooms,

BALL ROOM

LOBBY

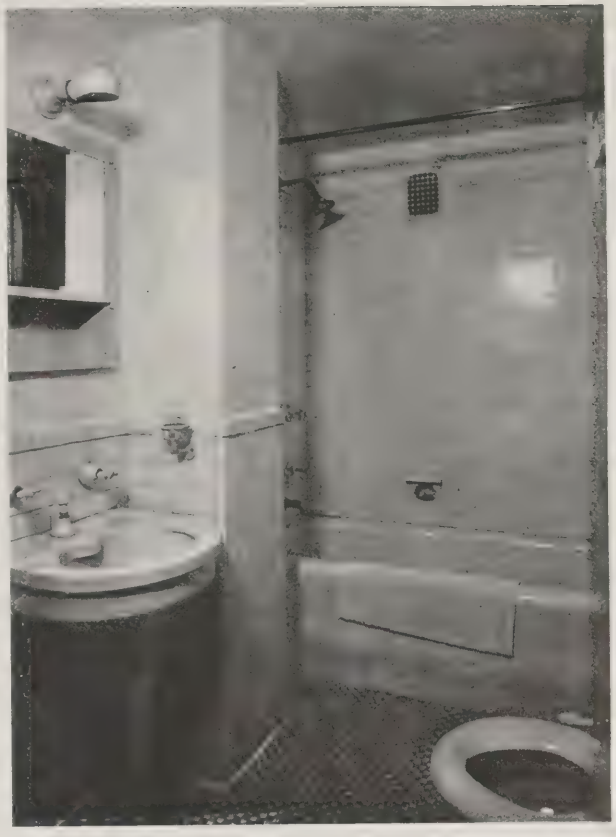
GEORGE WASHINGTON HOTEL, WASHINGTON, PA.
W. L. STODDART, ARCHITECT

is a difficult one. If conventions are to be sought, a room of this character is always necessary, and if local activities, such as Rotary and Kiwanis Clubs and social functions can be depended on, the space will show a fairly regular use. In any case, the ball room should not be located in valuable space that can better be used for other revenue-producing purposes. If a guarantee of patronage for the private dining rooms can be secured in advance, this will be valuable in determining their number. It is well in any case to have them grouped together, so that they can be turned into one room for larger functions. They should be placed in the building also with careful relation to the kitchen service. Except in special cases, I believe it is a mistake for a hotel that is primarily commercial in character to provide a roof garden.

Passenger elevators should be grouped together, but in the small hotel it is not necessary that the service elevator be in the same bank. One passenger elevator should be installed for every 100 guest rooms. The service elevator should be placed in such a location that it will serve with equal facility the kitchen and the rear entrance for the handling of trunks, etc. It is generally planned in conjunction with the service stairs and, provided a corridor or passageway is arranged for access to it from the lobby, it is not necessary to have it adjoining the lobby. One service elevator in the average small hotel is sufficient.

There is very little room food service required in a hotel of this type, and the service elevator will take care of any calls. There is therefore no need for providing dumbwaiters. If the kitchen is propery located with respect to the various dining rooms there is also no need of dumbwaiters or dish conveyers common in the large hotels.

The kitchen should be as large as the main dining room and on the same level with it. If it serves a banquet room on a floor above it, it is only necessary to have a good staircase with a pantry at the head of it. The food is taken up in bulk from the kitchen on the service elevator to the pantry for serving.

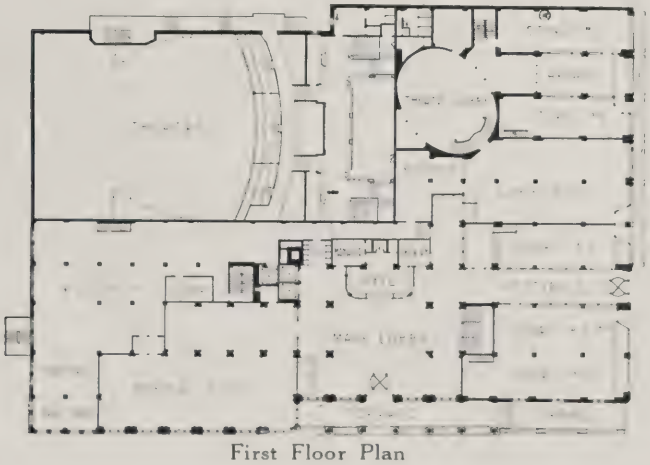


A typical bath room in the smaller commercial hotel showing character of fixtures and accessories

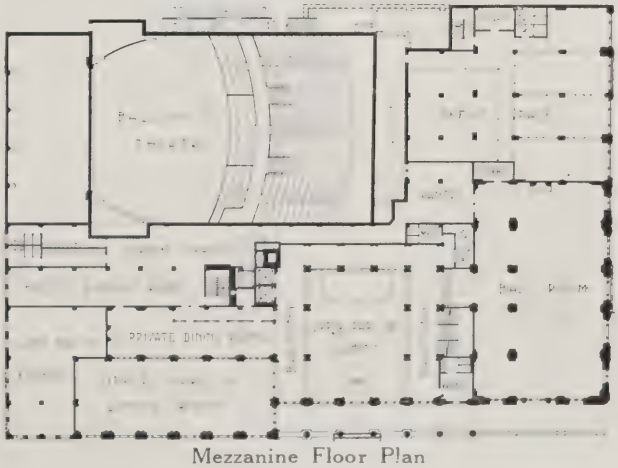
Incorporating the laundry in the hotel of from 100 to 300 rooms is a matter on which lessees have divided opinions. In general, however, it is preferable to have the flat work done in the hotel if the finances will permit. For a 200-room hotel the cost of a satisfactory installation would be in the neighborhood of $12,000. A hotel of this size would of course not undertake any laundry service for guests.

Mechanical equipment should be reduced to the minimum because of the cost of operating and main-

Note: Additional plans and illustrations of the George Washington Hotel appear on Plate 93.



First Floor Plan



Mezzanine Floor Plan

George Washington Hotel, Washington, Pa.
W. L. Stoddart, Architect

tenance. It is necessary to have forced ventilation in the kitchen, and this would be provided by ducts for the inlet of fresh air and exhaust ventilation from the hoods over the ranges. The rooms in the basement, such as barber shop, billiard room, grill room, etc., are generally so closed in that artificial ventilation here is necessary. To provide fresh air is sufficient; the exhaust will take care of itself. The only additional rooms requiring exhaust ventilation are the bathrooms, and this is accomplished by means of exhausting the shafts which are connected up with a large exhaust fan at the top of the building. The modern method of installing bathrooms in a hotel of any size is to group them along the corridor walls with a pipe and air shaft between each two rooms. This makes it possible that the ventilation be simply worked out.

Very few hotels of 300 rooms or under are equipped with their own power plants. It requires the employment of skilled men, and the cost of the service proves too expensive. In most cities satisfactory arrangements can be made with the local electric service companies to provide electric current at reasonable cost for elevators, motors, illumination and other needs.

A certain amount of steam is needed in the kitchen, and this is provided for by putting in high-pressure boilers tested to 100 to 125 pounds and equipped with reducing valves to bring the steam down to the pressure required for the various uses. In this way there are no problems of handling exhaust steam, and the heating of the building is accomplished by installing an auxiliary low-pressure boiler. Water is heated in a boiler equipped with copper coils and fed with steam from the high-pressure boiler. About 40 pounds steam pressure is required for the kitchen, and from 40 to 50 pounds for the laundry.

Refrigeration is provided by the installation of automatic plants where boxes are set to a certain temperature; when this temperature is reached the plant automatically shuts down and does not need any attention. The plant is operated by an electric motor, and the ammonia system is that generally selected. This plant can also be equipped to make from one to two tons of ice daily, which will meet the requirements of the average hotel. Similarly, it can be enlarged sufficiently to take care of running ice water in the guest rooms. An important point in refrigeration is the insulation of the pipes, particularly those supplying ice water. They should of course be kept away from steam risers, but with asbestos, composition or cork covering of sufficient thickness they can be accommodated in the bathroom pipe shafts without any great waste of cold.

The planning of a successful modern hotel, whether in a large city or a fairly good-sized town, is work to which the architect must bring his best skill, together with all the vision and experience which he and his organization can command.

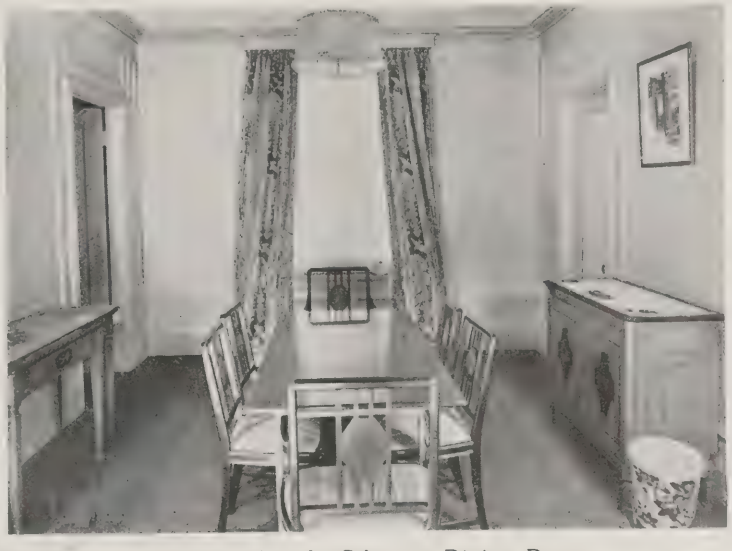
Lunch Room, George Washington Hotel, Washington, Pa.
W. L. Stoddart, Architect

Typical Private Room Interiors

THE decoration and furnishing of hotel guest rooms have in the past few years been greatly improved in their approach to the simplicity and refinement of the private house. A large portion of the traveling public today appreciates simplicity, and hotel managers have endeavored to meet their desire. The hotel room has made great progress toward cleanliness and sanitary qualities in the elimination of plush and velour hangings, the simplification of furniture upholstery with the use of firmer fabrics, and the elimination of dust-catching stuffs from the walls. Painted plaster walls seem to be preferred to wall paper; they are sanitary, and have the advantage of appearing cool in summer, and with proper coloring and the accent of attractive hangings, warm and homelike in winter.

Los Angeles-Biltmore Guest Room

Ambassador Parlor



Los Angeles-Biltmore Dining Room

Guest Room and Detail of Parlor, Ambassador Hotel, New York

Power Plant and Refrigeration Equipment

By J. F. MUSSELMAN, M. E.
Consulting Engineer, New York

IN discussing the matter of hotel power plants, it might be well at the outset to come to an agreement as to what is to be included. Whether or not all parts may fall within the technical limitations, we shall include, for the sake of convenience, all equipment located within the confines of the engine- and boiler-rooms, and required in connection with the generation and transmission of steam, electricity and refrigeration.

In modern hotel work, throughout the parts of the world where the climate demands heat, it is unusual for steam to be bought from outside sources, but in cases where steam is available from some central plant in the vicinity, the saving in space that can be effected by the omission of a plant is sufficient to justify the purchasing of this service, even at a price considerably above the actual cost of generating the steam, for as a rule the basement of every hotel is crowded, and every inch of it is needed for kitchens, storerooms and ventilating machinery, to say nothing of the usual custom of occupying a large part of it for grill rooms and concessions, which bring in a substantial income. To construct a sub-basement is often impossible and invariably expensive, to which disadvantages must be added the annoyance of coal and ash handling and the rather remote danger of accidents or explosions.

On this basis it might be said that the best possible power plant for a hotel, where conditions permit, is none at all. If steam is available from some outside source, it goes without saying that the purchase of electricity will also be possible; but for refrigeration, this is different, on account of the fact that the cost of the insulation of long runs of brine piping is almost prohibitive. For this reason, hotels for which refrigerated brine from an outside source is available or can be procured are so few as to be negligible.

For suburban hotels and resorts, usually located on less valuable land than is common in the built-up parts of cities, the power plant can be located to the best advantage in a building separated from the hotel proper. With this arrangement all objections are overcome. The coal handling and ash removal occur where noise is not a factor, and the rupture of a steam main or an ammonia pipe or a flywheel explosion may cause the inconvenience of a shutdown, but cannot endanger the safety of guests. An isolated plant of this kind should be sufficiently close to the hotel to make possible the economical transmission of brine for the refrigeration, and over or alongside of the plant can be located the laundry, which removes another objectionable and space-occupying department from the hotel proper.

Assuming the necessity of a boiler plant and a refrigerating plant for a specific hotel project, the rate at which it is preferable to buy electricity from an outside source brings up a question on which the engineering doctors are sure to disagree. The number of factors bearing on the case is almost unlimited, and no two of these factors seem to be the same for any two projects. The cost of labor, the rental value of the space, the possibility of communication of noise, are each about as important as the prevailing rate for electric current and the cost of fuel.

In hotels of average size, say of 500 rooms, it is safe to assume that the electric current can be generated for approximately two cents per kilowatt hour, which generating cost includes the interest and depreciation on the plant, the cost of fuel and supplies, and the cost of all labor chargeable to the generating plant. This figure would not include, however, the rental value of the space occupied by the plant, which might be prohibitive or might be negligible. The figure of two cents per kilowatt hour is based on average costs of fuel and labor. This figure will vary with the local conditions, the efficiency of the plant and the size of the hotel, through a wide range, from less than one cent to as much as four cents. It might be said in this connection that the load factor of a hotel is surprisingly uniform and will remain within the anticipated range for a greater number of hours per day and with less variation from day to day than in almost any other kind of building. This in itself tends to reduce the cost of generating current, and also reduces the standby equipment to the minimum.

Nothing can be done in the way of estimating either the cost of generating or the cost of buying current until the maximum daily demand and the annual consumption are determined. In looking over the operating sheets of a number of large hotels it appears that the maximum daily demand for all light and power is from .35 kilowatt per room to .4 kilowatt per room. These figures allow nothing for current to operate an air-cooling plant, but on account of the fact that an air-cooling plant, if used, will only be operated in this climate for about three months of the summer, and that these three months are coincident with the period of the lowest daily demand, it is probable that the last figure of .4 kilowatt per room will be sufficient to accommodate an air-cooling system on a small scale for the dining room and grill.

Another point that will affect the maximum daily demand is the question of whether or not an electric kitchen will be used. It seems that these are becoming more popular of late and, where the current cost is low, the advisability of using electricity instead of gas or coal for ovens, ranges and grills, is

worth considering. If a complete electric kitchen and bakery are used, it will add to the maximum daily demand probably 25 per cent and will increase the size of the plant in about this same proportion.

The total annual electric consumption of a hotel can best be expressed in terms of annual consumption per room, inasmuch as the current used for the lighting of public spaces, for the laundry and miscellaneous power and for the ventilating system will be approximately in proportion to the number of rooms. This annual current consumption per room should run from 1,700 to 2,000 kilowatt hours per room, which is enough to include all motors for elevators, an adequate ventilating system and the laundry, but allows nothing for an electric kitchen or refrigeration, which latter may be electrically driven, but is more often driven by steam.

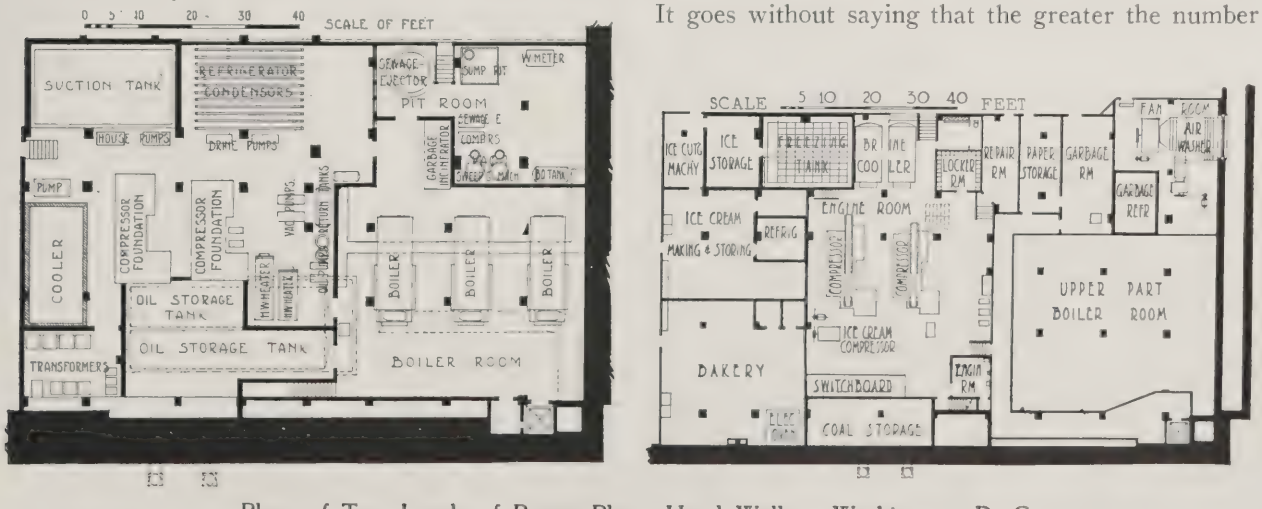
In order to bring the current consumption down to the amounts given, it is necessary to economize rigidly in the selection of the lamps, especially in the bedrooms. There is nothing gained in illuminating comfort by using lamps of too high a wattage in the bedrooms, and the current consumption of such lamps has a decided effect on the profit-and-loss sheet. For a large room with twin beds, together with its bathroom, the total wattage of all lamps should not exceed 200 watts, and 185 watts is altogether adequate if the tone of decoration is light. For the average small, single bedroom and its bathroom, the total wattage should run between 125 and 150 watts. Another electrical waste that is common throughout the bedroom floors is the over-illumination of the corridors.

With the size of the generating plant established, the number of generating units and their sizes are next to be determined. The minimum safe number consistent with economy, where no breakdown service from an outside source is available, is three units, each having a capacity of one-half of the total maximum demand. With this arrangement, one unit will carry the load for about 6 hours at night, the second unit operating in parallel for 18 hours. This allows one standby unit for repairs or emergency at all times.

The boiler plant of a hotel must be, in the nature of things, high-pressure, or at least medium-pressure, whether a generating plant is used or not. The kitchen equipment and laundry equipment cannot be operated successfully on low-pressure steam, and the boiler plant becomes less complicated if all boilers are operated at the same pressure, in which case the pressure of the steam for heating can be reduced in the boiler-room and supplemented by any available exhaust steam.

The size of the boiler plant, throughout the north, is more likely to be determined by the heating load than by the capacity of the generating plant, for in the coldest days of winter the exhaust steam from the generating plant and the refrigerating plant will have to be supplemented, almost surely, by live steam from the boilers. Two other items that should be taken into account in establishing the boiler horsepower are the steam used for the kitchen and the surprisingly large amount of steam required to heat the water for domestic use. The boiler horsepower required for the kitchen of a 1,000-room hotel would probably never exceed 30 horsepower, but the same hotel would consume at peak loads, in heating its hot water for baths, kitchens and laundries, not less than 250-boiler horsepower. The actual boiler horsepower required for the heating apparatus and ventilation could be estimated in a rough approximation at about one boiler horsepower for every 8,000 cubic feet of gross contents of the building.

With a boiler plant again, a three-unit plant with all units of the same size, two having a combined capacity equal to the maximum load, makes the most desirable arrangement. There is little chance of being forced to shut down two boilers of a plant for cleaning and repairs at the same time, and even if this did happen, one boiler probably could be forced to shoulder the whole load for a short while. It goes without saying that the greater the number



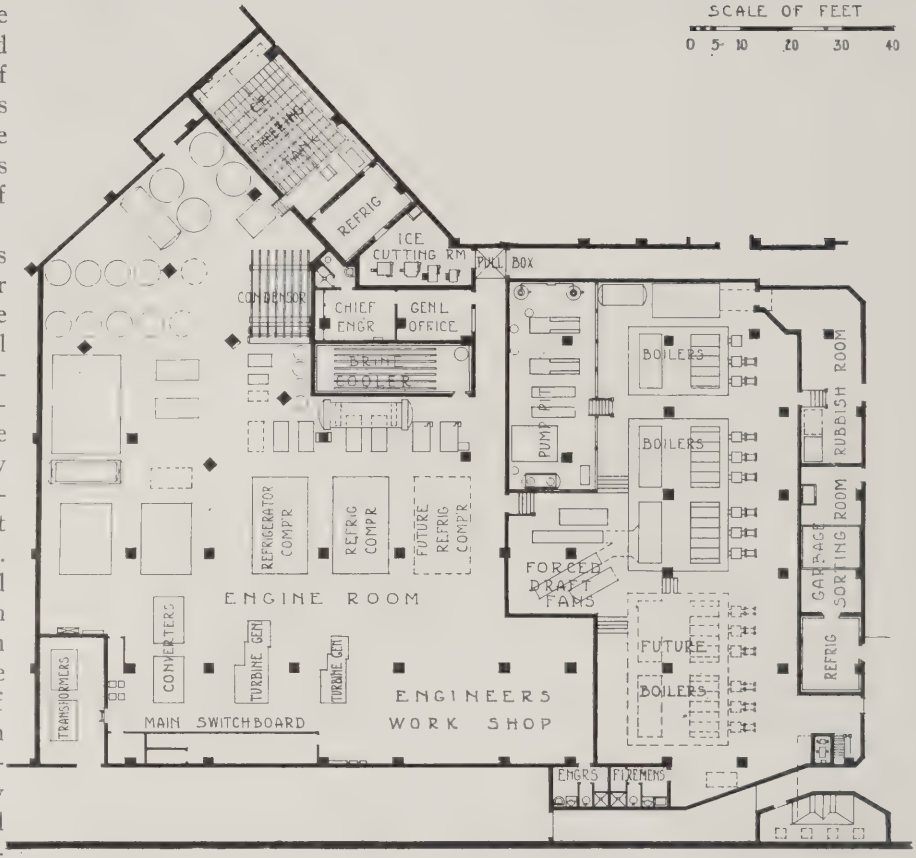
Plans of Two Levels of Power Plant, Hotel Walker, Washington, D. C.

Electric current is taken from an outside source, the boilers being of a self contained fire box pattern, designed for oil fuel, with provision for quick conversion for use with coal. The oil storage tanks are located under the floor of the coal room

J. F. Musselman, Engineer; Robert F. Beresford and Warren & Wetmore, Associated Architects

of units in the plant, the greater is the flexibility and the smaller the percentage of standby equipment. But this readily can be overdone, as the first cost of the smaller units is greater per horsepower of capacity.

The space limitations, as found, or as conceded under protest, are likely to dictate queer arrangements of a hotel plant, but, after all, the attitude that the plant is a necessary evil may have some justice in it, for it isn't really ornamental from the architect's point of view, and it brings in no visible income. For this reason the plant will probably find itself located in the most undesirable area in the building and with little reference to convenience of fuel handling or to the location of the chimney. These difficulties can be overcome by careful study, and if the total floor space available is sufficient and the height adequate, it is about all that can be hoped for—and possibly more.



Plan of Power Plant, Hotel Statler, Buffalo, N. Y.

Equipped with pressure water-tube boilers. Electric service of 25 cycle from outside converted to direct current. Provisions made for future installation of turbo-generators
J. F. Musselman, Engineer; Geo. B. Post & Sons, Architects

The anticipated growth of patronage of a modern hotel generally makes it necessary to provide in the original design for future enlargement, either vertically or horizontally. This must be taken into account, not only in the boiler-room layout, but in the arrangement of the entire plant. The vacant spaces left for future boilers and future units of the generating and refrigerating equipment may have the appearance of a bad investment, but on the whole the total investment in this way will be substantially less than would be the cost of moving out some other department in the future to provide space for power plant extensions.

The type of the boilers and the character of fuel used will depend on the size of the project and the price at which fuel can be had. For large hotels, boilers of the water-tube pattern are generally used, especially where a generating plant is involved. Water-tube boilers can be more perfectly cleaned than boilers of any other type, and if the quantity of steam wasted through the exhaust head is considerable, involving a considerable amount of raw make-up water, this question of perfect cleaning is vital to the life of the plant. In cases where the boilers are used for only heating and cooking purposes, which involve very little make-up water, the deterioration of any type of boiler is not great, and under these conditions a tubular or fire-box type of boiler is considerably cheaper and about as efficient.

Where coal is used as fuel, its price and its character will determine the advisability and kind of stoker. A hotel in this respect is no different from any other building with the same load. Where the plant is small enough to be handled easily by one fireman, it is doubtful if stokers make an economical investment, unless having them permits use of a cheaper fuel than could be used otherwise. Even where this is the case, the same results can often be had with pinhole grates and a forced draught system.

Oil as a fuel is gaining in popularity of late, even in the east, which is closest to the mines and farthest from the wells. The difference in cost is not wholly responsible for this popularity, although there is little doubt but that a saving can be made by the use of oil in a high-pressure plant in an eastern city under the present comparative prices of coal and oil. But from the standpoint of convenience, fuel oil is even more attractive, for one of the greatest sources of annoyance in hotel work is the handling of coal and ashes.

In justice to the coal man it must be said that oil can be wasted by inefficient firing with much less effect than coal, for in order to waste coal it at least must be handled and fired, which is not true in the same degree with oil.

The reliability of deliveries of coal and oil is about equal, with the recent coal shortage working the balance in favor of the oil. Whether or not the

oil supply is in danger of exhaustion is something that can be guessed at, but cannot be determined. On this score, there is some satisfaction in the knowledge that if the world's oil supply is exhausted, as many geologists hold that it soon will be, there is no great trouble or expense involved in converting back to use of coal.

Economy of operation of a generating plant is based on the utilization of as nearly all of the available exhaust steam as possible. In winter this is simple, for the heating system needs it all the more, but the wasted heat of the wasted exhaust in summer is the thing that is so likely to make a generating plant a losing proposition, and the reason why generating plants in summer hotels are rarely advisable. Aside from the heating system, the exhaust steam will, of course, be used for heating water and in connection with some parts of the laundry and kitchen, but this does not account for all that is available, and brings up the point of the possibility of using exhaust steam in an absorption refrigerating plant. This possibility deserves more consideration than it ordinarily gets. It of course increases the pressure on the exhaust system, which reduces the efficiency of the generating plant, but the over-all efficiency of this arrangement with a generating plant is considerably higher than that of a compression plant, where a large part of the exhaust from both the generating engines and the compressors is wasted.

In order to hold down to a minimum the initial investment in plant, it is well to look into the possibility of using a breakdown electric service from an outside source. Such a service, where available, can be used to help out on unusual peaks. If the price is right for this breakdown energy and the maximum demand charges not too high, a plant can be designed on the simplest possible lines, that will give a truly wonderful efficiency. Such a plant needs no standby units, and the generating units or unit become simply makers of exhaust steam, so proportioned that the amount of exhaust steam available is just equal to the demand. An example of this arrangement is found in the Pennsylvania Hotel in New York, which has only one 500-kw. generating unit.

For hotel work engines of the Uni-flow pattern are well adapted. This type of engine has been considerably improved in design within the last few years. Its comparatively high efficiency at low loads has made the design popular, and it is being used now in fields which were served for many years by the Corliss engine alone. Steam turbines have been used to a certain extent in recent hotel work. They are low in first cost and occupy comparatively little space, but their efficiency under back-pressure conditions and at low loads has never been quite as good as that of a well proportioned reciprocating engine; and then the reliability of the steam turbine under these conditions has not been altogether satisfactory, and as yet their use is not frequent.

If the electric current is to be generated on the premises, it should be, by all means, direct current. There is no possible point in using an alternate current generating plant for this character of building, unless it be to conform to the characteristics of an outside service. The cost of generating and distributing direct and alternating current for the building is approximately the same, but direct current is somewhat better for motors which require speed variation, and very much better for elevator work. In fact, it is only within the last two years or so that high speed elevators of alternating current pattern have been worked up to a state even approximating perfection.

With current from an outside source, it is a case of take what you can get; but if this happens to be 25-cycle, alternating current, something has to be done about it. This low frequency gives a constant flicker in the lights which is noticeable, and in fact objectionable, to anyone who has not been educated down to it. If the frequency is 60-cycle, the character of the illumination and the wiring for lighting are the same as with direct current, and the lighting of the building can be thrown at pleasure from a direct current plant to an alternating service. In this case the converter equipment need be only large enough for the direct current motors, while with a 25-cycle service it will be called on to convert the total load of power and light.

The character of the dining room and restaurant business and the policy of its steward, rather than the size of the hotel, determine the capacity of the refrigerating plant. In the immediate vicinity of New York there are hotels operating very comfortably with 10-ton plants, while other hotels with the same number of rooms have 50-ton plants, struggling under the load. To strike a guess average of an uncertain variable, it might be said that a city hotel with a good restaurant business and with running drinking water in every bathroom will require about four tons of refrigerating capacity per hundred rooms. This will generally suffice to cool all kitchen and pantry boxes, to freeze the necessary ice, and to chill the drinking water. Of this amount about one ton of refrigerating per hundred rooms will go to the drinking water system and its piping, while one-half of a ton per hundred rooms will be consumed in the form of ice.

The figures given for the refrigeration required to cool the drinking water and supplying the amount of ice which the hotel will demand are startling when analyzed from a heat unit standpoint. They show that an average hotel occupant consumes during a maximum hour almost half a gallon of drinking water and a quarter of a pound of ice. This can be accounted for, however, by the radiation losses in the piping of the drinking water system and the fact that the greater portion of ice which is frozen never finds its way to the dining room. The luxurious rate at which the drinking water system consumes refrigeration should not condemn it in a

modern hotel, and the practice of furnishing chilled running water in every bathroom has become prevalent and will remain so. The importance of properly insulating the pipes of the drinking water system in order to reduce to a minimum this constant radiation loss can hardly be over-stated. These pipes generally run in warm pipe spaces, along with steam pipes and hot water pipes, and inasmuch as refrigeration is expensive to produce under any condition, the best possible covering of the ice-water pipes is none too good.

Another unnecessary waste in connection with the refrigerating apparatus that can be overcome at the outset is the practice of using cheap, thin-walled refrigerators.

The character of the refrigerating plant proper depends generally on the character of the power plant. If electricity happens to be cheap and fuel dear, a motor-driven compression system would be used, but if an ample quantity of exhaust steam is available at a sufficient pressure, an absorption system is more economical. Where the compression system is used, the refrigerant need not be ammonia, necessarily, and a great many recent hotels have used carbon dioxide plants. These carbon dioxide plants are not quite as efficient, theoretically, as ammonia plants of the same sizes, but the use of an inert and perfectly harmless gas has tremendous advantages in case of a rupture in a refrigerant line.

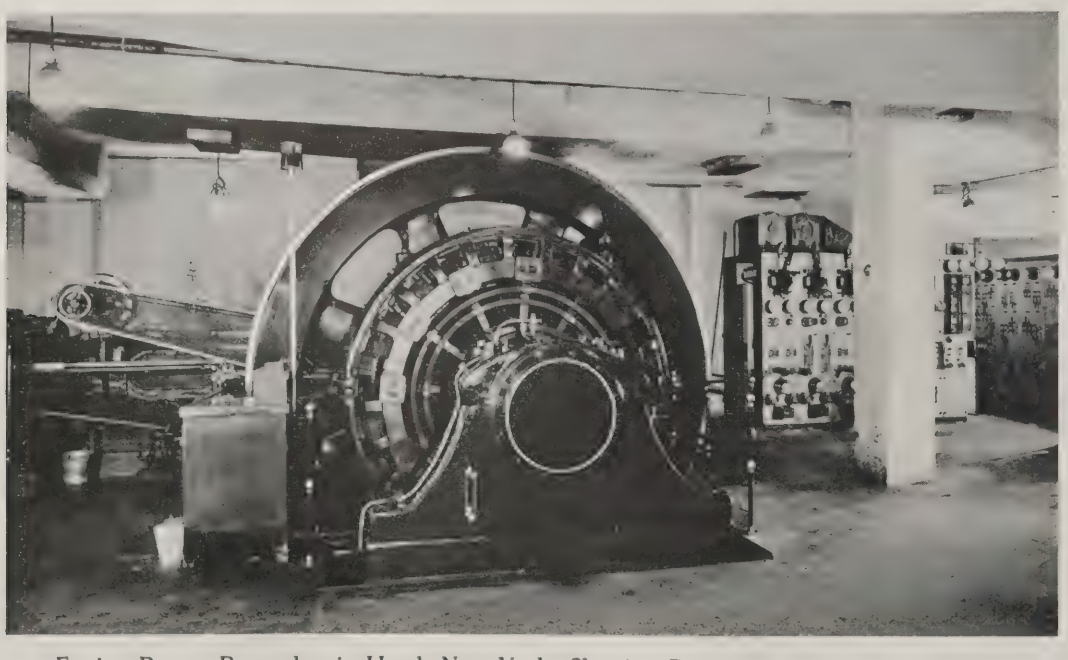
As an offset to this advantage the makers of ammonia machines bring up the point that the pressure required for the ammonia system is only a fraction of that necessary with carbon dioxide. This is obvious, but after all, when piping and condensers are being constructed for high pressure it is not very much more difficult to construct for a 950-pound pressure than for say, perhaps, 180 pounds.

Until comparatively recently, it has been the practice to install only one refrigerating machine in each hotel. The occasional shutting down of this machine for repairs and overhauling is unavoidable, and when this occurs it involves inconvenience and loss that are not warranted by the saving in first cost. It is fully as important to provide a standby unit in the refrigerating plant as in the boiler or generating plant. This standby unit need not be of full capacity, for it is comparatively easy to curtail the refrigeration for a few days.

On account of the fact that the temperature required for making ice cream is considerably below the economical brine temperature for other parts of the refrigerating system, it is generally advisable in a large hotel to provide a separate small refrigerating unit, used only to freeze and harden the ice cream. The first cost of such a unit is considerable, but from an operating standpoint it puts the main refrigerating plant on a much more economical basis.

The cost of power is not the only large item in the operation of a refrigerating plant. The water used in the condensers, if wasted, is costly and sometimes exceeds the water consumption of all other parts of the hotel. The condensers warm this water very slightly, and there is no objection to using it for domestic purposes, after it has passed through the condensers. The rate of flow through the condensers is very constant and, in order to use this water, a large cistern or tank must be provided to take care of the variable rate of consumption in the domestic system.

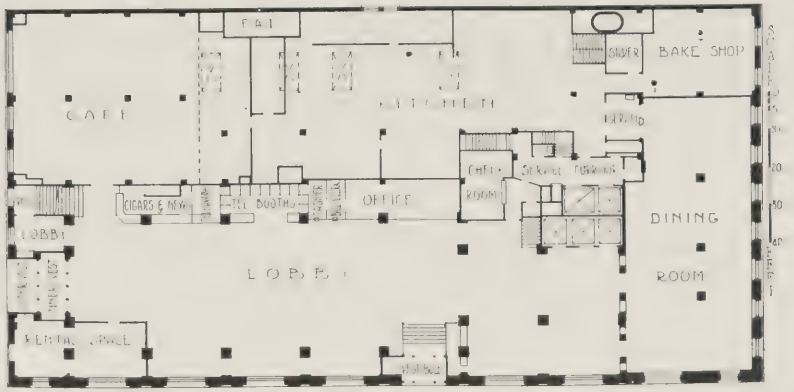
The capacity of this surge tank can be determined only by plotting the curve of domestic demand against a curve of condenser water.



Engine Room, Pennsylvania Hotel, New York, Showing Dynamo and Main Switchboard
McKim, Mead & White, Architects

GENERAL VIEW OF EXTERIOR

INTERIOR OF LOBBY



FIRST FLOOR PLAN

HOTEL TEXAS, FORT WORTH, TEXAS

SANGUINET & STAATS AND MAURAN, RUSSELL & CROWELL, ASSOCIATE ARCHITECTS

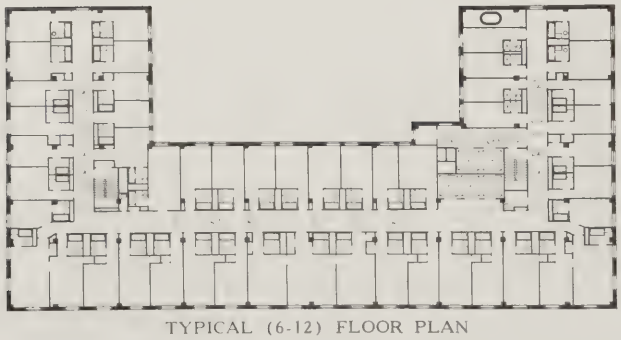
HOTEL TEXAS, FORT WORTH

Illustrations on Plate 91

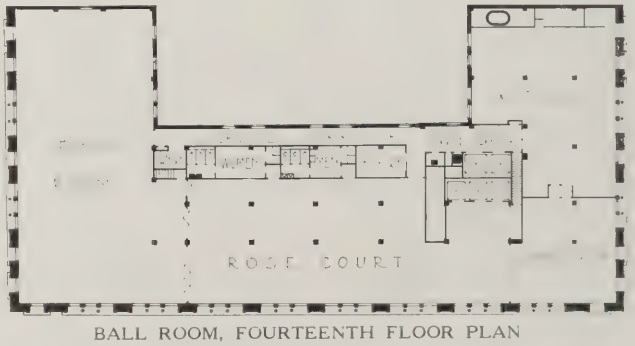
This hotel has 438 guest rooms, each with private bath, and two floors are given over to sample rooms and a number of special suites. The dining facilities include a main dining room seating 100, a cafe on the street frontage, and three private dining rooms on the mezzanine equipped with a service pantry.

The ball room, 4,259 square feet in area, is on the 14th floor, grouped with two dining rooms, all of which can be thrown together, accommodating 3,000 people. This group is served by a complete kitchen. The 15th floor is given over to service and employes' quarters. The total floor area of the building is 271,514 square feet; its contents is 3,165,000 cubic feet, and it cost, including architects' fees, laundry and other equipment, but exclusive of furnishings, $2,566,000.

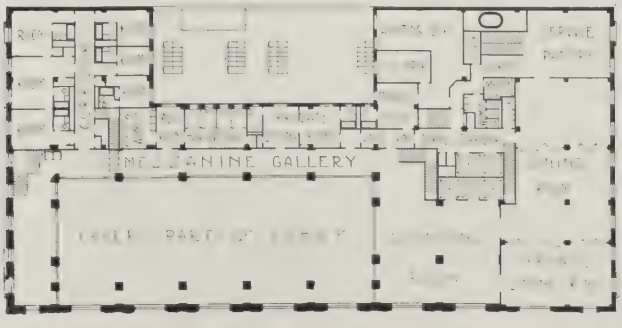
SERVICE, FIFTEENTH FLOOR PLAN



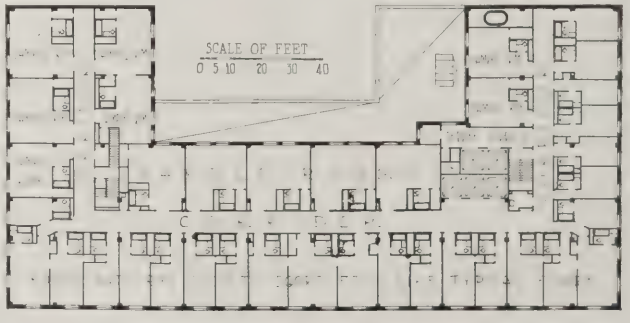
TYPICAL (6-12) FLOOR PLAN



BALL ROOM, FOURTEENTH FLOOR PLAN

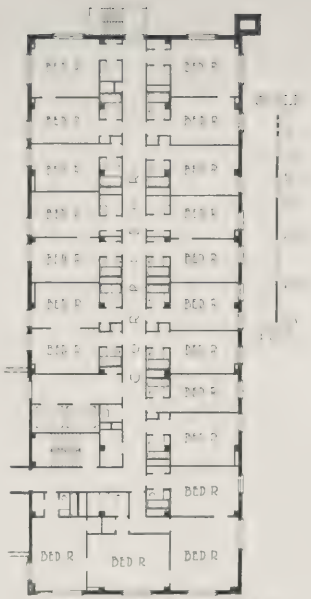


MEZZANINE FLOOR PLAN



SAMPLE ROOM, THIRD FLOOR PLAN

GENERAL EXTERIOR VIEW
SAN JUAN HOTEL, ORLANDO, FLA.
W. L. STODDART, ARCHITECT

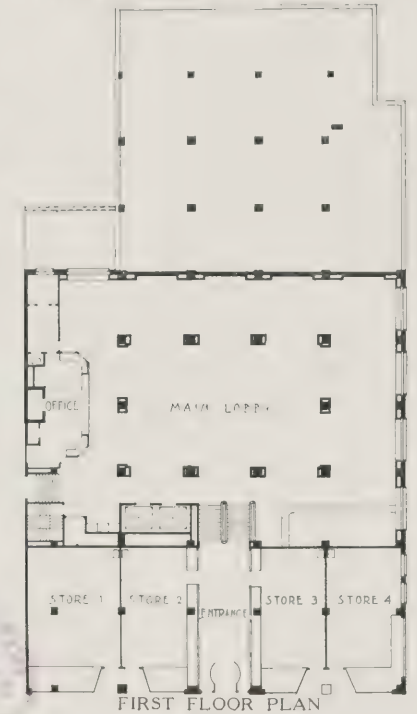


TYPICAL FLOOR PLAN

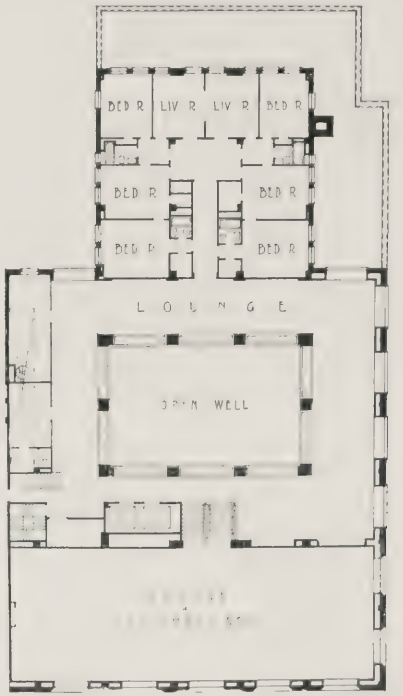
This is the first wing of a three-wing building. The old hotel remains at the left, and contains the coffee room and kitchen; the dining room and new kitchen will be provided in future construction. The present wing contains 135 guest rooms and baths, and the total capacity will be 400.

The construction is fireproof, of reinforced concrete with hollow tile and stucco exterior walls. Marble and tile floors with faience tile wainscoting are used in the public rooms. Heating is by low-pressure steam system from crude oil fuel; fresh air is supplied to lobby; stationary vacuum cleaning plant is installed.

Total contents 900,000 cubic feet; approximate cost of building, exclusive of furnishing and professional fees, $450,000, or 50 cents per cubic foot. Date of general contract, February 1, 1922; date of completion, January, 1923.

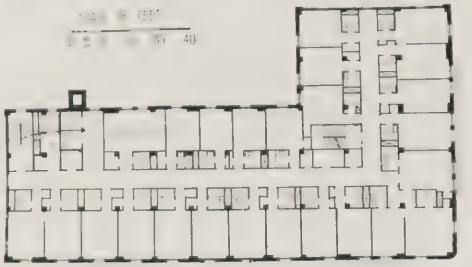


FIRST FLOOR PLAN



SECOND FLOOR PLAN

BASEMENT PLAN



TYPICAL FLOOR PLAN

This hotel contains 220 guest rooms and baths; future provision will add 200 rooms and baths. The dining room seats 200 people, the coffee room 100, and the grill room 150. These rooms and the ballroom, which accommodates 400 people, are served by one kitchen.

The construction is fireproof, of reinforced concrete and steel; the exterior materials are red brick and terra cotta. Heating is by low-pressure vacuum steam from coal fuel; power furnished from central station. Mechanical equipment includes laundry; ventilating system, air washing, refrigeration, vacuum cleaning, and water-softening. Contents, 1,846,000 cubic feet; approximate cost, $1,070,000 or 58 cents per cubic foot. The building was completed in December, 1922.

GEORGE WASHINGTON HOTEL, WASHINGTON, PA.

W. L. STODDART, ARCHITECT

PERSPECTIVE STUDY OF STREET FACADES

PERSPECTIVE OF COURT SIDE

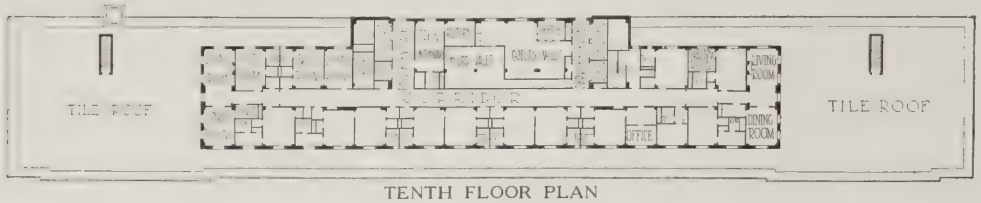
ATLANTA-BILTMORE HOTEL, ATLANTA

SCHULTZE & WEAVER, ARCHITECTS

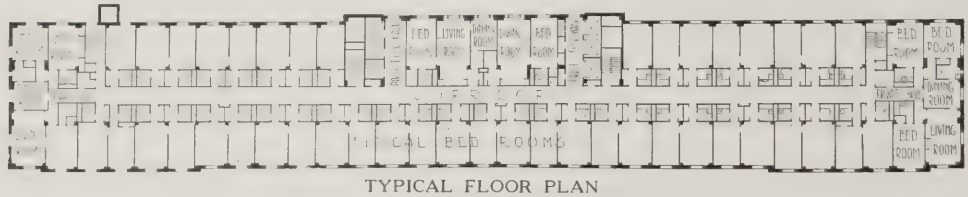
ATLANTA-BILTMORE HOTEL, ATLANTA

Illustrations on Plate 94

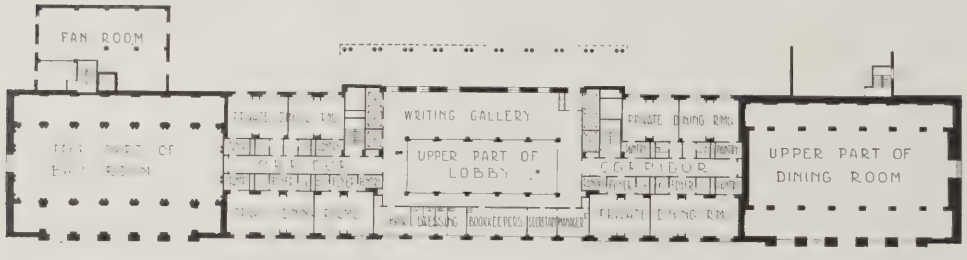
This hotel is at present under construction; it is built in the shape of a large U, with the court away from the street; the wings are devoted to apartments supplied with hotel service; the hotel proper is confined to the main street frontage. The building contains 539 guest rooms and 477 baths; the total dining room capacity is 1096, the rooms served by 2 kitchens and 3 pantries. A ball room accommodates 475 people. The construction is fireproof, with reinforced concrete frame and floors. Power is secured from central station service; heating is two-pipe steam system from coal fuel; mechanical equipment includes ventilation for public rooms and spaces below street, air washing for the public rooms, 60-ton refrigerating plant, and two-unit, eight-sweeper capacity vacuum cleaning plant.



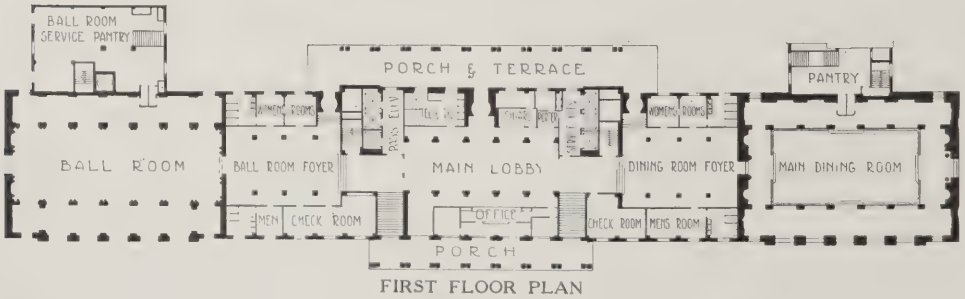
TENTH FLOOR PLAN



TYPICAL FLOOR PLAN



MEZZANINE FLOOR PLAN

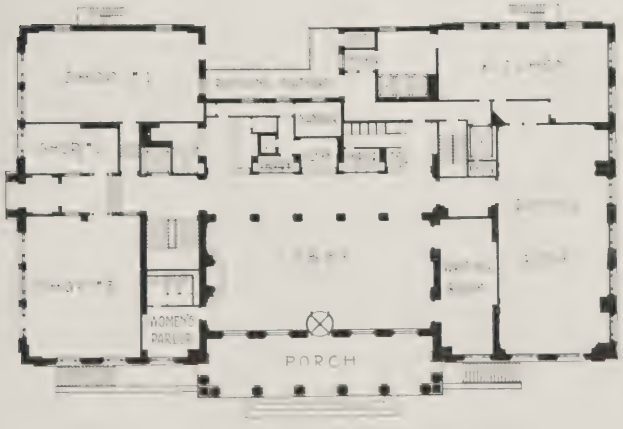


FIRST FLOOR PLAN

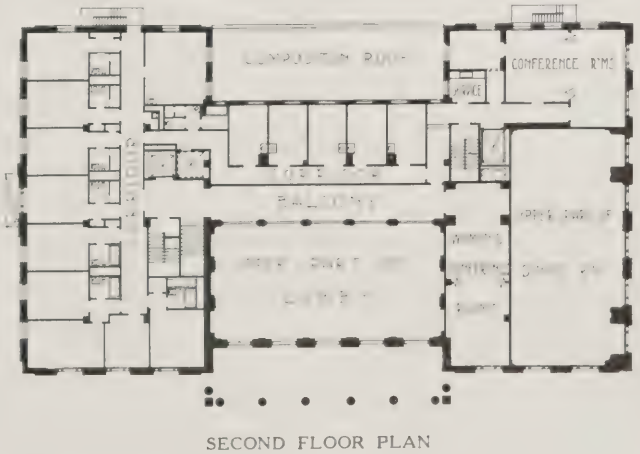
GROUND FLOOR PLAN

GENERAL EXTERIOR VIEW

This building is arranged to serve local community and social needs as well as to provide accommodations to the traveler. It contains 80 guest rooms, the majority of which are supplied with private baths; the smaller rooms at the front and rear of the main block are equipped only with lavatories, and general toilets are arranged to serve them. A large lobby and dining room, finished in Georgian wood paneling to accord with the exterior, and the ball room on the fourth floor comprise the public portions aside from three conference rooms on the mezzanine. The ball room is served from the main kitchen by elevator. Three shops are incorporated on the ground floor below the guest rooms on the mezzanine floor.



FIRST FLOOR PLAN

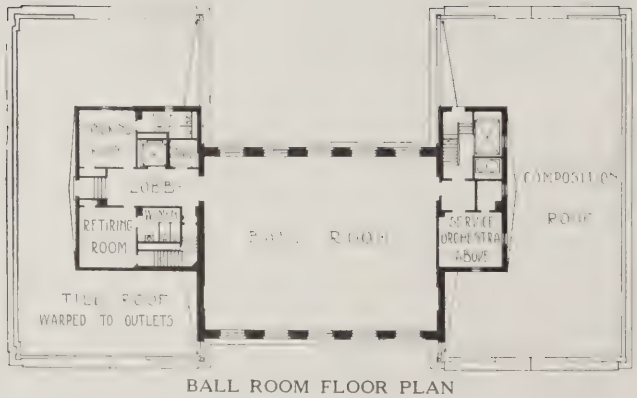


SECOND FLOOR PLAN

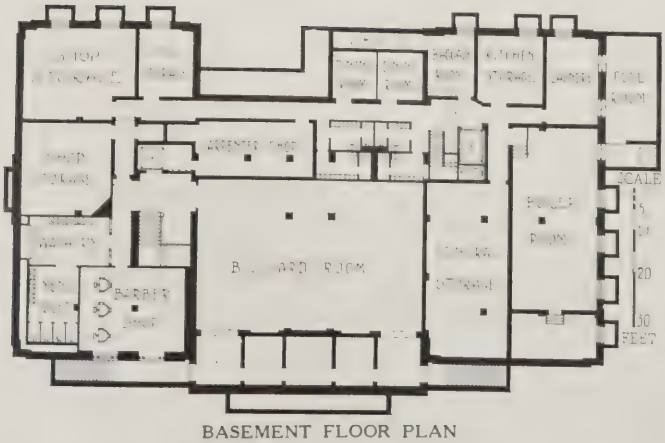
NEW CAPITAL HOTEL, FRANKFORT, KY.

FRANK L. PACKARD AND LEO L. OBERWARTH, ASSOCIATED ARCHITECTS

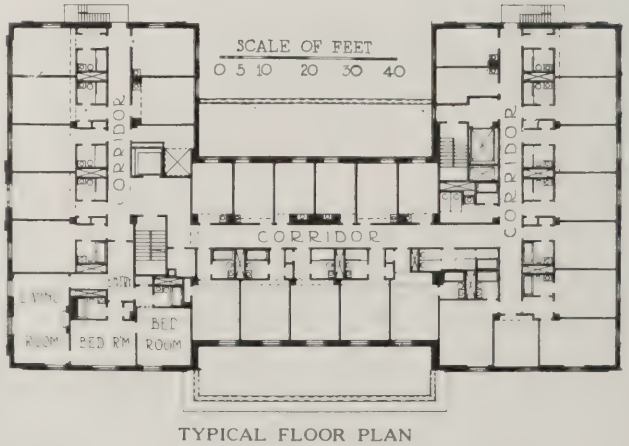
NEW CAPITAL HOTEL
FRANKFORT, KY.
Illustrations on Plate 95



BALL ROOM FLOOR PLAN



BASEMENT FLOOR PLAN



TYPICAL FLOOR PLAN

GENERAL EXTERIOR VIEW

DINING ROOM

BANQUET ROOM

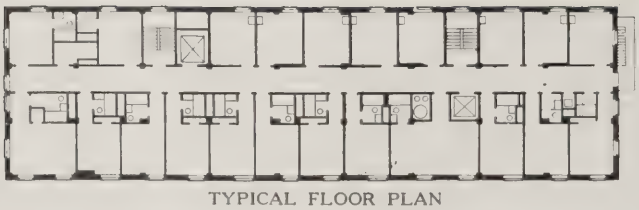
GREYSTONE HOTEL, BEDFORD, IND.

NICOL, SCHOLER & HOFFMAN, ARCHITECTS

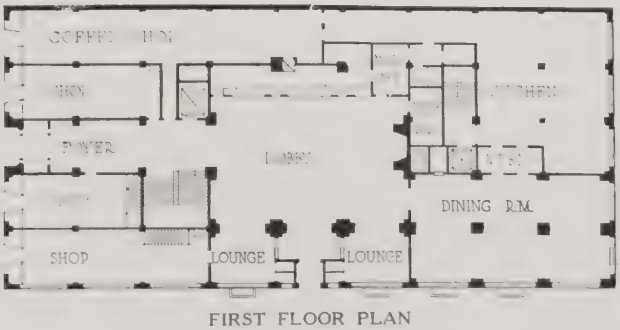
HOTEL GREYSTONE, BEDFORD, IND.

Illustrations on Plate 96

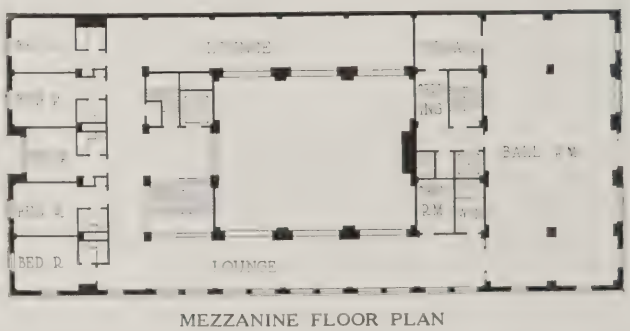
This hotel represents a modern solution of the typical commercial hotel problem in the smaller city. It contains 87 guest rooms, inclusive of four sample rooms, one on each typical floor adjoining the freight elevator; 35 guest rooms are supplied with lavatory only and general toilet facilities, but no baths are supplied for men and women on each floor. The public portion comprises the main lobby with mezzanine gallery, lounge and dining room. A banquet or ball room, 30 x 61, is directly over the kitchen and connected with it by elevator and stairs. The street frontage is occupied by four shops, one of which is fitted up as a coffee room with service from the kitchen.



TYPICAL FLOOR PLAN



FIRST FLOOR PLAN



MEZZANINE FLOOR PLAN

Hotel Heating and Ventilating

By ARTHUR K. OHMES

of Tenney & Ohmes, Consulting Engineers on Mechanical Equipment of Buildings, New York

THE question of having a suitable heating and ventilating equipment in a hotel deserves the most serious consideration of the prospective hotel owner or operator. If we regard as indispensable such modern conveniences as sanitation, refrigeration, water supply and electric light, we must admit that there are perhaps more joy and comfort to be had from a good heating and ventilating system than from any other item on the list. Sanitation and water supply rank together with suitable temperature conditions in importance to health, but real bodily comfort goes most of all with heat in the cold, dreary winter, and with coolness in the hot summer weather. Another factor must be considered, and it is that a good heating and ventilating equipment increases the efficiency of the worker and is one of the most important factors in making the guest satisfied.

The present conditions of unrest of the workers and the ever-increasing demands of the workers and of health departments, will all be conducive to making this provision of bodily comfort more and more compulsory. If not given by hotel owners, on their own account without outside force, such force will be supplied in the form of laws, regulations, etc.

The heating question is not difficult to solve for the reason that it is quite simple to oversupply a room with heat, because space conditions make it an easy possibility in most cases. Nor is an excessive installation expense incurred in doing so. Such practice, however, must be seriously condemned for the reason that the already high operating expenses with the present high cost of steam and coal, are greatly increased. Furthermore, unduly large radiators make it difficult to secure a healthful temperature for three-quarters of the heating season. After all, the maximum demand of a heating apparatus must be met only during a few days in the year, and on these few days good judgment demands that, if an error must be made, it had better be made on the side of a slight "underheating" instead of "overheating" of the room. This holds particularly true of the "transient" type of hotel.

Now consider the ventilating problem (which we may as well admit means that temperature conditions must be maintained within reason) of the modern hotel in our large cities with its underground spaces, many of which contain tremendous heat generators, the most common being the equipment of the engine- and boiler-rooms, kitchens, laundries, bakeries, garbage incinerators, etc. Where is there a large hotel in our cities which can claim that the ventilation in the warm summer weather has been solved at all times to the entire satisfaction of the help employed in these rooms?

When on these days humanity is decidedly uncomfortable (not to say wilting away) in its homes, or in parks, on mountains and lakes and at ocean resorts, what comfort can there be for the ordinary hotel worker? Is there a hotel operator who has not been annoyed by complaints and by sickness on account of heat in the hot and sultry summer weather? Indeed, where is the hotel manager who has not felt on these days of unrest that the ventilating question is the most difficult and nerve-racking question to be solved to the satisfaction of the help? The efficiency of the ventilating engineer, using constants which have proved fairly satisfactory in other installations, is then questioned, despite the fact that frequently building conditions such as low headroom and insufficient space, or badly insulated ovens, kettles, ranges, steam presses, drying rooms, steam pipes and steam cylinders, make his already difficult problems practically impossible of solution.

The ventilating engineer has the means at his disposal of creating the best atmospheric conditions by cooling which would satisfy all hotel workers, but where is there a hotel which could afford to be burdened with the tremendous first cost and the consequent high maintenance and operating costs of artificial cooling?

The Heating System

When deciding upon the heating system careful consideration should be given to the climatic conditions, the peculiarities of the average guest, and the installation difficulties. Every country has its own demands in the matter of heating, and it appears correct to say that the requirements of the average American guest are quite different from those of other countries. A guest will use his room during the day for various purposes, for frequently it will serve him in the morning for a breakfast room, then living room, and at night as bedroom. For 90 per cent of the guests, this means a warm room in the day and a cold room at night. A guest room in our hotels where such conditions cannot be quickly created by the heating apparatus would be considered as improperly heated. It is natural that a steam heating system is most suitable, for it gives a quicker heating-up effect when heat is turned on, and the heat effect of a warm radiator is quickly lost when steam is turned off at night.

Besides, in our northern climate the steam radiator does not readily "freeze up" when heat is partly turned on or when entirely turned off as

would be the case with a hot water radiator. Hotels have been heated with hot water in a few instances in our northern states, but frequent freeze-ups occurred, and the tremendous pressures existing in the pipe systems of high buildings make it scarcely a practical heating system. Although the writer is one of the firmest believers in hot water heating for private houses and institutions, he is firmly convinced that only hotels in our southern states (if not too high) should be considered as suitable for hot water heating. Thus, for instance, in a low hotel in Florida, where outside temperature rarely goes below the freezing point, and where heat is only required in the early morning and late evening hours, a hot water heating system would give the best results. It is fully realized that hot water heating is the most healthful heat, its supplying of heat is absolutely noiseless, and it is practically indestructible.

Heating by means of air warmed over steam coils at a central point has been in successful operation in a prominent large New York hotel for some 20 years, but its high installation expense and the considerable space required for ducts and flues usually prohibit its consideration for all localities except possibly for earthquake zones.

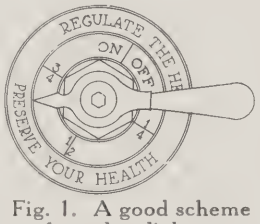


Fig. 1. A good scheme for valve dial top

We may perhaps look forward to using gas or electric heat for mild days in connection with steam heat for cold days, due to the ever-changing economic conditions and the new inventions made, but for many years no serious consideration need be given unless prices of coal and oil keep on mounting and the cost of electricity is reduced, due to the development of hydro-electric plants or central stations at the mines. On the other hand, there are said to be now quite a number of hotels in the mountainous regions in Europe where electric heat is used in rooms, or where steam or hot water is generated by electricity instead of by coal or oil. In these regions hydro-electric power is cheap, but coal very expensive, if it can be secured at all.

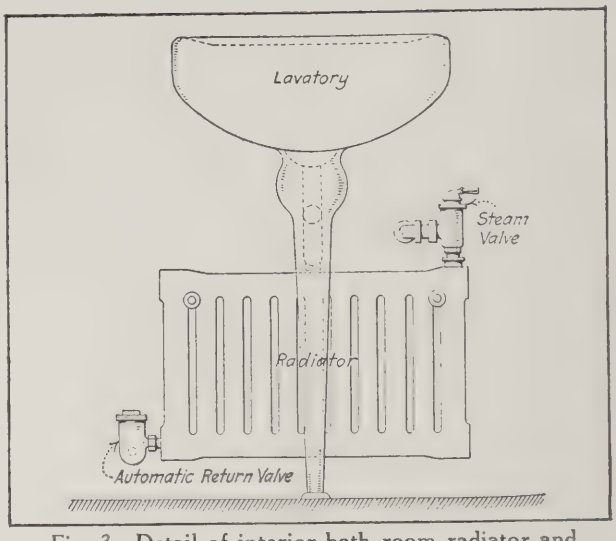


Fig. 3. Detail of interior bath room radiator and recommended position

Steam Heating System

The most suitable steam heating system for a hotel is a two-pipe system with return lines open to the atmosphere or with return lines kept under a vacuum of 5 to 10 inches by means of vacuum pumps. Either system allows the regulation of steam fed into radiators, and with it a heat regulation. Thus, for instance, by opening the valve slightly only a small amount of steam is fed into the radiator and with it a slight amount of heat is given out by the radiator. Recently a large hotel was completed where the dial top of the valve was finished as in Fig. 1, the purpose of which is self-evident.

All larger hotel steam heating systems should have vaccum pumps of large capacities to maintain a high vacuum. It will then, with a well designed pipe system, be

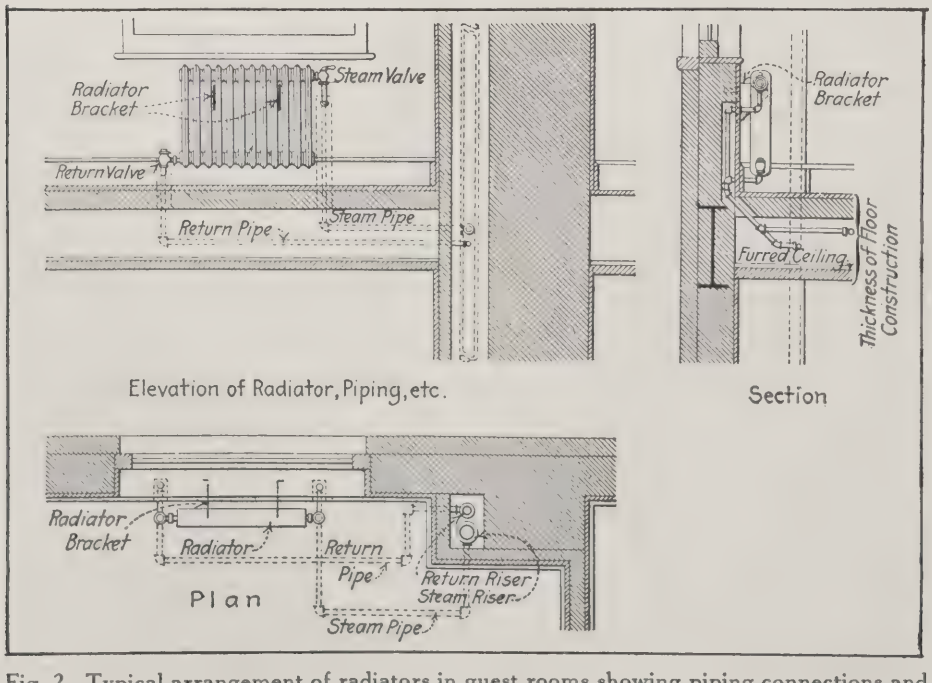


Fig. 2. Typical arrangement of radiators in guest rooms showing piping connections and entire clearance of finished floor

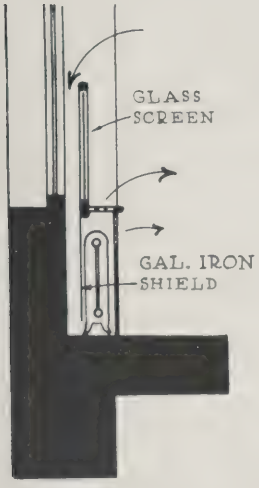


Fig. 4. Simple down draft prevention scheme

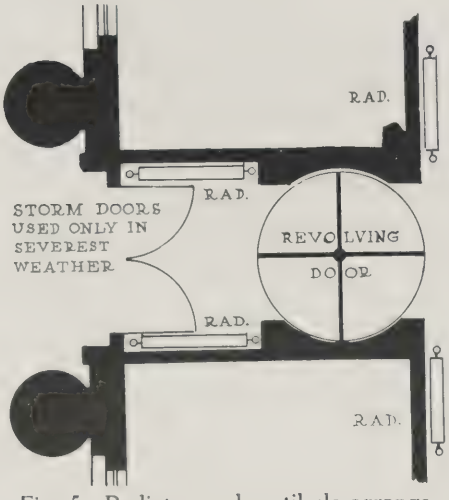


Fig. 5. Radiator and vestibule arrangement with revolving doors

possible to carry steam at less than atmospheric pressure in warmer weather, steam at atmospheric pressure in medium weather, and steam well above atmospheric pressure in cold weather. Such a method of operation is usually conducive to economy of steam consumption.

Heating System Details

Since all guest rooms are carpeted, due consideration should be given to making laying, removal or cleaning of carpets an easy possibility. A method where this has been completely accomplished is shown in Fig. 2. All bathrooms, even inside bathrooms in our northern states, should be heated, though in our southern states inside bathrooms need not be heated. A simple method is indicated in Fig. 3.

The present conventional arrangement of a guest room and its bath leads usually to the discussion of the most suitable place for the radiator. To illustrate, we shall consider Figs. 6 and 7 showing room arrangements with furniture. For the sake of convenience, we will consider them point by point:

Radiators in Rear of Rooms (Fig. 6)

Advantages

1. Ready access to piping for repairs, because piping is in accessible shaft.
2. Cheapter installation, because only one set of risers is required.

Disadvantages

1. Heat near head; frequent cause of headaches.
2. The ever-present slight noise from steam entering radiator; very objectionable to light sleepers.
3. Discolors walls.
4. Interferes with furniture arrangement.

Radiators Under Windows (Fig. 7)

Advantages

1. Prevents down draft from windows.
2. Makes it possible to sit in cold weather before window with comfort.
3. No interference with furniture arrangement.
4. Only washable curtains are discolored.

Disadvantages

1. Increased cost of installation, because two sets of risers are required.
2. Difficult of access for repairs, because one set of risers is in furred wall. Objection may be overcome by not furring-in riser.

In heating the main rooms due consideration should be given to table arrangements, and to possible chilling effects from large windows due to down draft. A down draft prevention scheme is shown in Fig. 4.

Main entrance doors should be of the revolving type, and where these are exceptionally exposed, vestibules should be provided in addition as shown in Fig. 5. This provision is of most importance in high buildings in our northern states.

Radiators should be kept some 2 or 3 inches from the walls so as to make it possible to clean the backs of radiators, which should be done especially before the heating season begins so as to prevent the odor from burning dust.

The final decision is usually governed by financial considerations, the class of hotel erected, and the individual whims of the hotel operator.

Automatic temperature regulation installed many years ago so frequently in hotels has been mostly discarded in newer hotels. This is mainly due to better heating systems and to the fact that the average hotel guest was not familiar with the operation of the thermostat itself. It is natural that operating conditions suffered when such delicate instruments as thermostats were being "fixed" by men who in most cases had never seen them or at best "ran across" them but a few times a year.

In view of the general remarks made on the ventilation of hotels, it seems desirable to illustrate by a concrete example the essential differences exist-

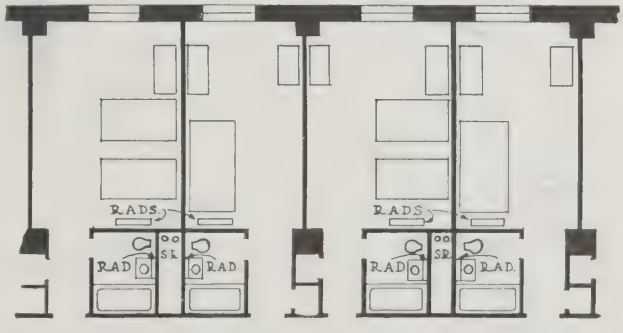


Fig. 6. Typical inside bath room guest units with radiators against rear wall

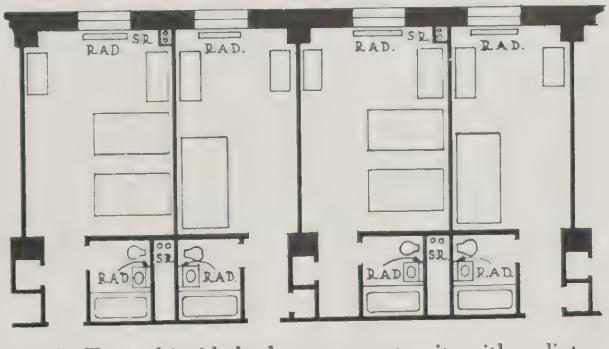


Fig. 7. Typical inside bath room guest units with radiators under windows

ing between hotel ventilation and that of other buildings, even where of a more or less similar class.

Ventilating Requirements

The writer designed lately the ventilation for two kitchens serving on the average about the same number of people; the difference is that one serves a hotel and the other a hospital. As a rule, less service will be required and less costly meals will be prepared in a hospital (particularly as in this case it is a pubic hospital) than in a high class hotel. This statement may seem peculiar in view of the fact that sick people should be better taken care of than healthy people. The average "house count" in both is about the same, for the hospital is for about 2,000 beds or 2,000 people, the hotel for 1,500 rooms or about 2,000 people. Naturally, the hospital has no ball room and private dining room service, such as the hotel has, which frequently tax the kitchen tremendously. If we consider the dining room service to outsiders in a hotel, we must come to the conclusion that very much more work must be done in the hotel kitchen than in the hospital kitchen.

Now then as to the space conditions provided for doing the work: The hospital kitchen is 50 feet wide, 100 feet long, and 23 feet high. Ground area 5,000 square feet, cubic contents 115,000 cubic feet. The hotel kitchen is 44 feet wide, 44 feet long, and 9 feet high. Ground area 1,931 square feet, cubic contents 17,424 cubic feet. In other words, the hotel kitchen has 38.7 per cent of the area of the hospital kitchen, and only 15.3 per cent of the cubic contents of the hospital kitchen. In addition to this the hospital kitchen has large windows, whereas the hotel kitchen is entirely underground, without any outside exposure whatsoever. It is just this condition which makes the hotel ventilating problem so difficult for the ventilating engineer. Similar conditions exist in all other departments, such as laundry, garbage disposal room, bakery, engine- and boiler-rooms.

The problem of a ventilating system in a hotel is ordinarily one of heat removal in the case of engine- and boiler-rooms, kitchen, laundry, bakeries, etc., or smoke removal in ball, banquet or private dining rooms, or odor removal in a bathroom, toilet or locker room. The question of stuffy air scarcely ever enters, nor the chemical composition of the air; if heat, smoke and odors are removed to the satisfaction of either the hotel, guest or smoker, the "ventilation" is good.

To illustrate the different requirements of the ventilating system on a 90° day compared to say a zero day, we may compare our own living rooms ventilated by windows. On a 90° day every window and door is wide open, whereas on a zero day everything is almost tightly shut. Still, we breathe as much air and consequently contaminate the air inside equally as much on each day. Yet we feel more comfortable on a zero day with worse air in a room than on a hot day.

Artificial ventilation in an underground room, giving at the best a proportion of 2:1 between minimum and maximum, is now supposed to give as much satisfaction as a room with several windows. The writer has often contended that the ventilation of really important underground spaces, such as kitchens and laundries, should have two ventilating systems to proportion about 70 per cent and 30 per cent of maximum capacity, both systems to run in warmest weather, the 70 per cent system in spring and fall, and the 30 per cent in cold weather. With proper motor control air proportions of 6:1 could be secured. Such treatment would also give a reserve system for the most important departments, but the increased costs and space condi-

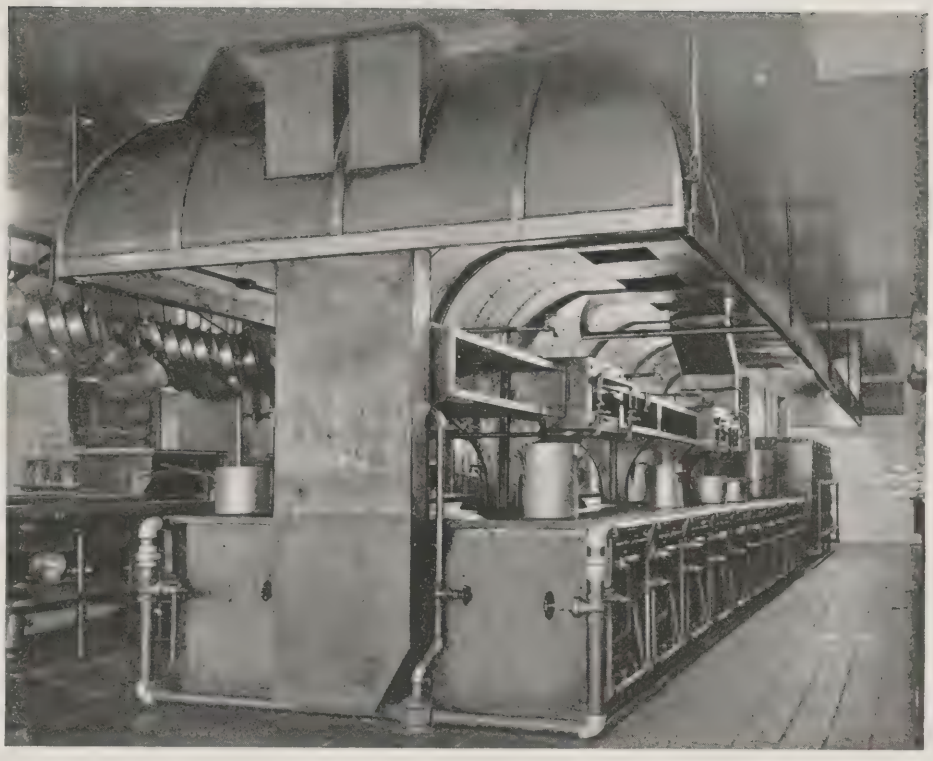
Kitchen of Los Angeles-Biltmore Hotel, Los Angeles, showing swivel exhausts outside range hood

Schultze & Weaver, Architects; Clyde R. Place, Engineer

tions make this scheme usually prohibitive.

As to the maximum quantities to be allowed, we have had rooms better ventilated by ten changes an hour than others with 30 changes an hour. This is due to crowded conditions, low headroom, uncovered heat sources, etc. To give, therefore, rules for air changes without taking these factors into account would be both erroneous and confusing.

For the arrangement of flues and registers, it is well to follow as far as possible the laws of nature where working and architectural conditions permit them to be followed. All heat generated should be removed where generated. Hoods and curtains are essential to confine the heat so as not to allow it to come into the working spaces. Top exhaust is desirable for smoke removal, and the reversible system as described in THE FORUM for June, 1923, is particularly well adapted for ball rooms, etc.



Center grouping of ranges in kitchen of Pennsylvania Hotel, New York, showing large exhaust hoods
McKim, Mead & White, Architects; Tenney & Ohmes, Engineers

In locating the various fans consideration must be given to noise transmission prevention. Machinery cork insulation should be applied, but it is far better not to rely to any great extent on this and to locate the fans and motors only above rooms where a slight noise and vibration can be tolerated. As to cleaning air, many good means such as various air washers or air filters are available, but it is best to locate the fresh air inlet in a clean place where really fresh air is to be secured.

As to the space conditions for ventilating equipment, notable progress has been made in the latter years. The tendency has been toward smaller and more efficient fans. In connection with this more and more attention is being paid by ventilating engineers to avoiding offsets and bends in ducts and flues. This has resulted in allowing higher air velocities. Years ago 24 feet per second in main flues was considered high, whereas now 35 feet per second is frequently allowed.

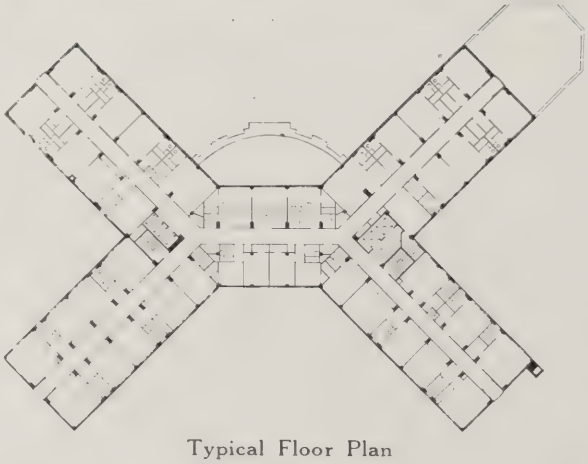
At present the entire program of building a hotel is contradictory, in that the heating appliances as usually installed are good for 20 to 30 years, the ventilating equipment for from 10 to 100 years, and the building itself for from 50 to 100 years. During the life of the building, according to the apparatus designed, it must be expected to make occasional replacements at a tremendous expense.

To estimate the average life of the integral parts forming the heating and ventilating equipment, this list is presented:

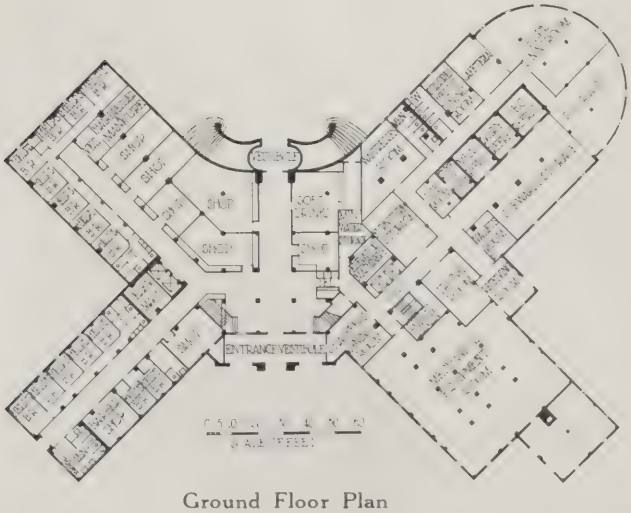
Boiler Plant and Accessories		
All cast iron boilers	30-50	years
Steel boilers	25-40	"
Steam Heating Systems		
All cast iron radiators	25-40	"
Steel or wrought iron pipes for steam lines	20-40	"
" " " " " " return "	10-30	"
Cast iron fittings on steam lines	50-75	"
" " " " return "	20-50	"
Cast iron valves on steam lines	50-75	"
" " " " return "	20-50	"
Brass valves on steam lines	50-75	"
" " " return "	30-50	"
Hot Water Heating Systems		
All materials (Cases on record where pipes of 65 years' service were as good as new.)	50-100	"
Indirect Heating and Ventilating		
Galvanized iron ducts and flues and fans in dry places, well covered and carrying dry air	100	"
Ditto in moist places carrying moist air inside, not covered subject to condensation and corrosion	5-25	"
Copper and nickel alloy flues, not subject to chemical reactions	100	"
Ditto subject to chemical reaction	5-25	"

Experience proves that whenever moist air must be conveyed, and where such ducts and flues are located in cold spaces, which would set up condensation on the inside, the ducts must be well covered to avoid condensation on inside, and with it corrosion. Similarly, where cold air is conveyed in ducts running through moist places, the ducts must be well covered to prevent outside condensation.

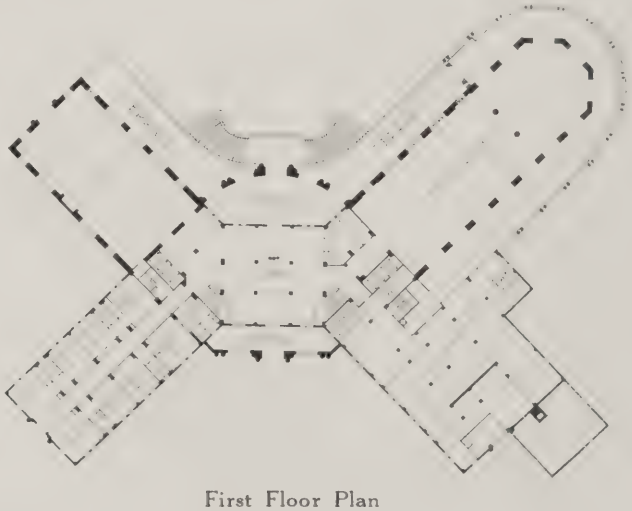
THIS is a resort hotel, now under construction at Miami. It has 200 guest rooms with 140 baths. This is the maximum number of rooms that the management considers convenient to provide with a particular, personal service. The dining room seats 750 and caters to a large outside patronage. The only other public room is the lounge, which will accommodate 300 when used for social functions. The construction is of reinforced concrete throughout, with stucco and cast cement exterior. A two-pipe steam system supplies heat to the principal rooms, and aside from a 7-ton refrigerating plant there is no other mechanical equipment. The plan is of particular interest in that all features of the hotel have been provided above ground with several shops opening onto an arcade.



Typical Floor Plan



Ground Floor Plan



First Floor Plan

NAUTILUS HOTEL, MIAMI, FLA.
SCHULTZE & WEAVER, ARCHITECTS

Sanitation and Water Supply in the Modern Hotel

By CLYDE R. PLACE

Consulting Engineer on the Mechanical Equipment of the Biltmore Hotels

THE modern hotel building is a complete world by itself, in that as soon as a guest enters the front door he must be accommodated and pleased in every way with the personal and mechanical resources the management has assembled, and in leaving he must feel satisfaction with his visit and anticipate the time when he can return. In order to insure this contentedness of the guest it is absolutely necessary that the hotel have every up-to-date mechanical appliance and arrangement, so that perfection of service can be realized.

The modern hotel has to accommodate and operate successfully various mechanical systems, consisting principally of heating, ventilating, plumbing, electrical devices, elevator, refrigeration and ice making, boiler plant and generator plant, laundries and pneumatic tubes. The up-to-date hotel is a complete unit, where food and supplies come in at one door when the guest comes in at the other, and the personnel and appliances of the hotel are organized to bring them together in perfect service; it may be likened to a modern manufacturing plant in which the product is not material, but service.

The water and sanitary systems in the modern hotel are very important features which must be carefully considered by design, and thought out in every detail. When the guest goes to the lavatory in his bathroom and turns on the hot water faucet, he wants hot water immediately, regardless of whether the room is on the first or the 20th guest room floor. To accomplish this means that in the basement of the building there must be ample hot water heaters to heat the water by means of exhaust steam from generators or low-pressure live steam from the boiler plant, and in addition it is often necessary to circulate this hot water by pumps throughout the building to give quick circulation in the piping and thus produce the desired results at the hot water faucets. In addition to the large hot water heaters for the guests, it is necessary to have separate large heaters for the kitchens and laundries for economical reasons, and due to the fact that the temperature of the water for the laundries and kitchens has to be higher than is needed for the guests. For such a system of hot water it is customary to use brass piping, for it has been found by experience that steel or wrought iron piping galvanized will give out in a few years' time under this service of variable kinds of water. In certain sections of the United States the hardness of the water demands that it be artificially softened so that it will lather freely, and so that the guest in washing or bathing will not be subjected to the uncomfortable feeling of roughness on his hands and body which often results by use of hard water. Furthermore, hard water will impair the efficiency of the laundry and will cause corrosion of the piping system, due to greater action of chemical components in the water when it is hot.

A filtering equipment of ample capacity to permit of slow filtration is essential in nearly all hotel installations. This equipment takes the raw street water and removes many impurities before it goes into the softening apparatus or suction tanks.

Water softening requires a complete working apparatus, consisting of a complement of tanks, piping and pumps and the like, located in the basement, into which the water is drawn and acted upon by salts and chemicals. After the water has been treated in this equipment it goes to a large surge tank, and in turn it is pumped to the top of the building, where there are several storage tanks, the elevations of which are sufficient to provide ample pressure to operate all of the plumbing fixtures throughout the building. Often the direct street pressure is sufficient to operate the fixtures on the lower floors, thus saving the cost of pumping the water for this section of the building. In case the height of the hotel is such as to make the pressure from the roof tanks too great in the lower portion, intermediate tanks are often introduced in the building, or else reducing valves are installed so that the water as it comes to the various plumbing fixtures throughout the building has about the same pressure. The water from the roof tanks also enters the hot water system as make-up water by way of the hot water heaters in the basement.

The cold water piping is generally either of mild steel or wrought iron, thoroughly galvanized; malleable iron fittings are used on the smaller sizes of piping and galvanized cast iron fittings on the larger sizes.

Differences of opinion exist as to the relative merits of various piping materials; it is impossible to lay down arbitrary rules for selection, because of the effect of local conditions; the chemical composition of water in different localities varies greatly, and a choice of piping can safely be made only after a chemical analysis and consideration of the reaction of the water on the pipe, or more often by local engineering experience. The cost of replacement is prohibitive in its disruption of service and in money; extreme care should therefore be exercised to see that the piping system is so specified and designed that it will endure throughout the normal, effective life of the building.

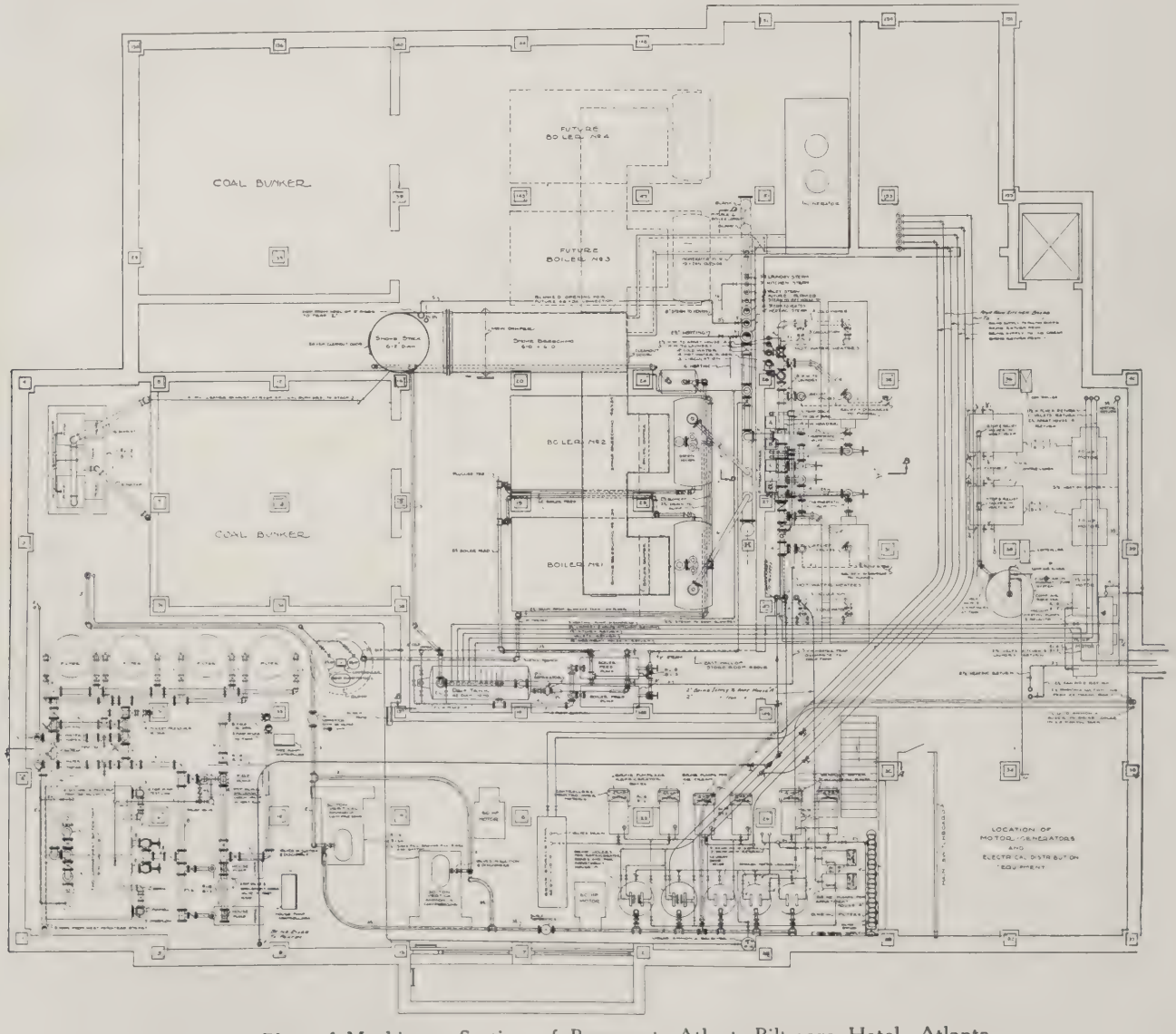
The valves in the plumbing system should be of standard manufacture, easy of duplication and adapted for endurable service, brass bodied up to 2 inches, and above that iron bodied. The larger

valves, such as those of 4 inches and above, should have riser stems to enable the observer to see at a glance whether the valve is open or shut. For cold water, generally globe valves are used for the smaller sized piping—2 inches and below—in order to obtain a throttle effect, and gate valves are used for all sizes above. For hot water under circulation, gate valves are used generally, because a globe valve allows a trap in the circulation, and globe valves are only used on short branches to fixtures.

One of the most important and vital features in the operation of an hotel is the elimination of all noise from whatever source, because many guests will complain even if in the bedrooms there is an automatic clock which every minute makes a slight noise. In order to eliminate noise as much as possible in the plumbing system of the building, it is necessary to provide ample air chambers at the plumbing fixtures so that water hammer will be avoided when the valve is closed suddenly. The air chamber acts as a cushion and permits the shock from a sudden stoppage of the valve to be absorbed.

The waste and soil piping system in the modern hotel is generally of galvanized wrought iron or steel piping with malleable and cast iron or galvanized iron fittings. In some sections of the country, and where a hotel of not too great height is to be constructed, and when every economy is necessary, extra heavy cast iron pipe and fittings are used for the soils, wastes and vents. The greater amount of the waste from the plumbing fixtures throughout the building can be taken directly into the street sewer, but as the lower portions of the hotel are often below the level of the sewer it is necessary to have electrically operated sump pumps or sewage ejectors for raising the waste to the sewer level.

It is customary in modern hotel construction to have the bathrooms so connected with the bedrooms and so located that they will be grouped in pairs about a common vent and pipe shaft and in a direct vertical line through the height of the building. This



Floor Plan of Machinery Section of Basement, Atlanta-Biltmore Hotel, Atlanta

Clyde R. Place, Consulting Engineer

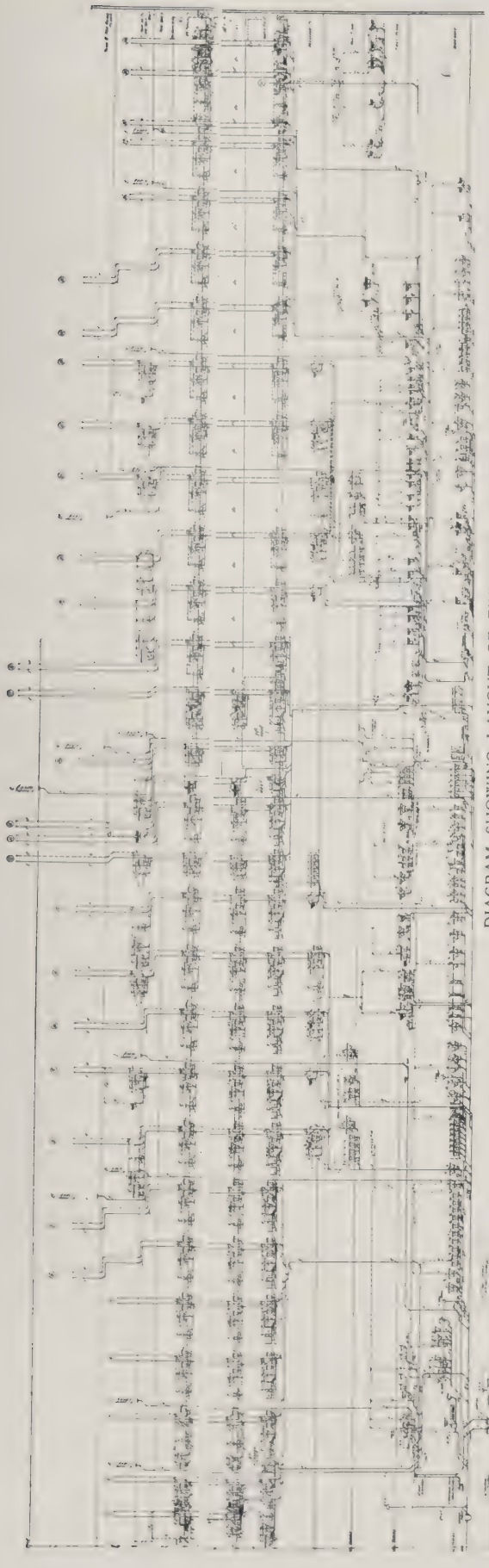


DIAGRAM SHOWING LAYOUT OF FIXTURES, WASTES AND VENTS

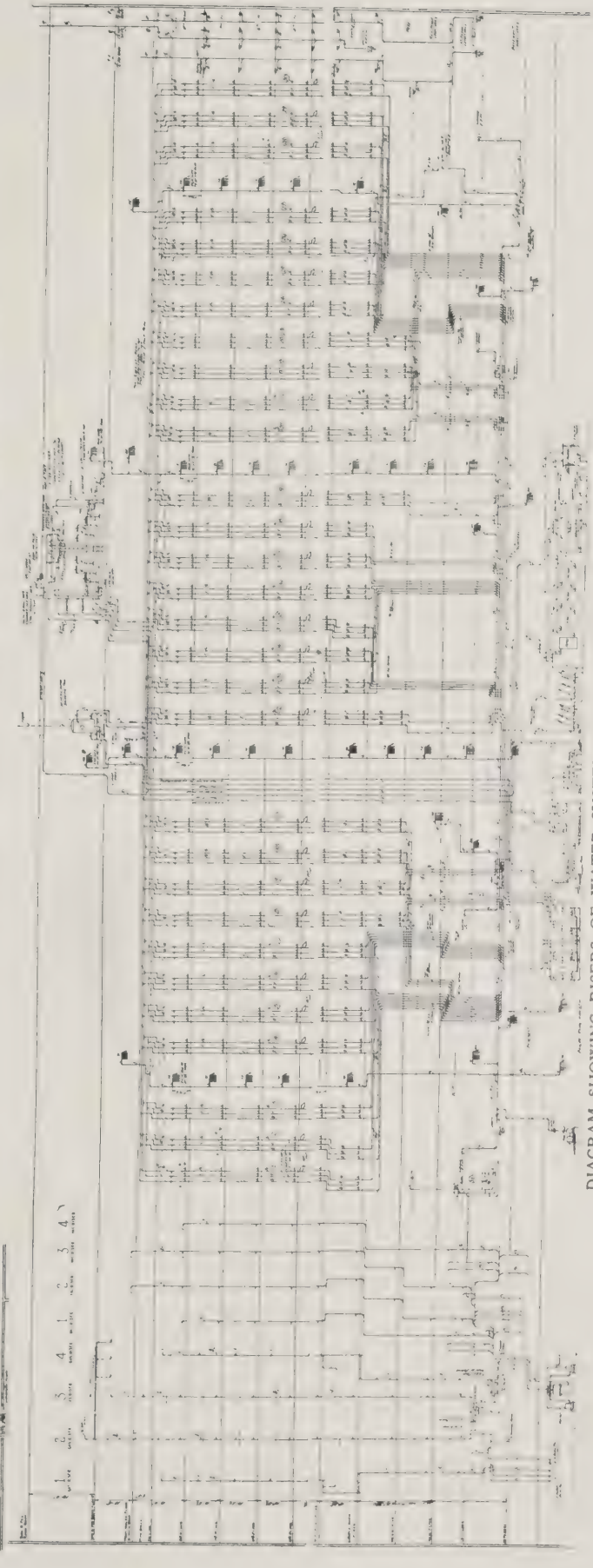



DIAGRAM SHOWING RISERS OF WATER SYSTEM AND MACHINERY IN THE BASEMENT
ATLANTA-BILTMORE HOTEL, ATLANTA

permits one common soil pipe through the building to be used for two bathrooms on each floor. This common system of piping likewise applies to the water supply lines—hot and cold, and iced drinking water.

All the various waste and soil lines coming down through the shafts scattered about the building are collected in the basement; it is difficult to collect them on any intermediate floor because of the lack of necessary space to give the required fall in horizontal lines and because of the always present danger from accident of leaks which would destroy expensive decorations of the public rooms.

Each waste or soil line should have a vent connected to the line just below the lowest trap and run in a plumb line to and above the roof. Each fixture with connection into the waste line should have a branch vent from its trap. These vent lines operate on the natural pull of the outer air; there is no need for artificial exhaust, though the bathroom shafts in which they occur are ventilated by exhaust fans on the roof. In hotel plumbing no attempt should be made to economize through eliminating recognized efficient principles of plumbing, even though local ordinances may permit. The same thought applies to the selection of fixtures and fittings throughout the hotel; quality appointments only should be considered; the initial cost is soon forgotten in satisfaction of service and freedom from constant maintenance expense.

In fitting shower baths, separate hot and cold water valves will meet the satisfaction of the great majority of guests. The experience of changing temperature of water after a satisfactory mixture has been obtained is due to improperly proportioned piping; even service can only be assured when tanks and piping of ample capacity are installed, so that sudden calls on the circulating system will not affect the free flow of both hot and cold water. All toilets throughout the building should be equipped with flushing valves; the use of tanks has been abandoned in all first class installations. The silent operation of toilets is most important, and this result is assured by the use of properly equipped flushing valves. The bowls should be of the syphoning type to further insure quiet operation.

The fire protection system throughout the building must be a complete and independently operating unit. This is now required by fire and insurance regulations in practically all cities. In the larger type hotel automatic filling house pumps and a hand-controlled fire pump are installed in the basement which pump directly into the roof tanks and piping system, and in turn serve the different hose connections in the building. On the roof there is a reserve of water, normally around 3,500 or 4,000 gallons, to supply water to the hose until the fire pump is started. At every stairway there is a standpipe, and on every floor there is a hose rack with a line of hose between 75 and 100 feet long. Through the lower floors of the building and in the service quarters this hose apparatus is distributed, and so located that there is no area but that can be reached by the water from the nozzle.

In case of fire, the first operation is to run to the nearest hose, which is usually designated by a red light, and open the valve; in view of the water storage on the roof and that in the standpipe system, there is sufficient water to respond immediately on the opening of the hose valve. With the operation of opening the hose valve the fire pump in the basement will have been started by means of the house fire alarm system, and this pump is usually of sufficient capacity to feed at the maximum pressure from 4 to 6 hose equipments, which is more than ample to take care of any normal fire in the building. In case it is seen that the fire is too large and dangerous to be handled by the hotel fire department, a silent alarm is sent to the city fire headquarters. The city department takes the water from the large street mains and pumps it into the interior mains through the siamese fire connections on the outside of the building which are connected with the standpipe system, and at which time the hotel fire pump stops operating. In some hotels it is necessary, because of insurance requirements, to put an automatic sprinkler system in the storage quarters below the street level. This installation is supplied from a roof tank or street pressure, and differs in no respect from the usual sprinkler arrangement. The house pumps generally are of the multi-stage centrifugal type, directly connected to electric motor. All are located in the basement and so cross-connected that either one or both may be operated on the automatic roof tank float switch system. The motors can be either of alternating or direct current type, depending upon the kind of electrical energy available.

All hot water plumbing lines should be insulated with a non-conductive heat covering, generally of magnesia, but sometimes of asbestos air cell. Cold water pipes are also protected by an anti-sweat covering in order to prevent condensation and dripping on the finished portions of the building. Where this piping occurs in exposed finished places, the covering is recanvassed, neatly sewed and painted to give a good appearance.

All piping lines must be adequately supported. Hangers are generally of what is called "blacksmith wrought construction." In horizontal piping the hangers are usually placed at distances of 10 or 15 feet apart, in accordance with the size of the pipe and what it carries. They should be firmly fastened, either to the steel or through the floor above. Vertical lines have horizontal hangers of "blacksmith wrought construction," with extended arms supported on or clamped to the beams of the building structure. Where piping is subject to expansion, such as hot water and steam lines, heavy expansion bends or loops must be installed, and between these bends the piping must be anchored so that it will travel from the anchor to the bends.

Elevators in Hotels

By BASSETT JONES

of Meyer, Strong & Jones, Inc., Consulting Engineers, New York

AS in high class office buildings, so in high class hotels, the tenant more and more expects and demands rapid elevator transportation. This, coupled with the increasing number of floors to be served and the consequent longer hoists, makes the elevator problem one of great importance.

The first step in determining elevator equipment for any given case is to establish the rate of traffic flow or the number of persons that must be moved by the elevators in a given time, together with the direction and distance over which they must be moved. Next the character of service must be established. The latter depends on three things: First, the length of time that a passenger can be expected to wait for a car, which determines the interval between cars. Second, the length of time a passenger can be expected to remain in a car, which determines the round-trip time of the cars. Third, the smoothness of motion of the cars which either determines the maximum velocity at which the cars can travel, or the special equipment that must be used to attain smooth motion and easy starts and stops with high velocity. Obviously, the higher the velocity and the less the time consumed in starting and stopping the car the shorter the round-trip time will be. For hotel service where the traffic is heavy, the stops frequent, and the hoists long, the use of the modern direct-drive traction elevator is advisable. Such elevators operate better, control better, are safer and decidedly more economical than the hydraulic elevator.

If the average round-trip time and the interval are known, the number of cars required to maintain the schedule desired is obtained by dividing the interval into the round-trip time. Of the round-trip time, 50 per cent or more is "standing time," which includes time consumed in opening gates and doors, time consumed in taking on and discharging passengers, and time consumed in false stops when the operator fails to make accurate landings. The number of false stops increases as the velocity of the elevators increases. The standing time, and, with it, the round-trip time, can be reduced by the use of adequate signaling devices and by the use of power-operated gates and doors. In any case only the best gate and door equipment should be used. False stops may be practically eliminated by the use of auto-levelers. Furthermore, auto-levelers add greatly to the quality of service and to the sense of security on the part of the passengers.

In large, busy hotels it is essential to put the guest cars under the supervision of a dispatcher who is kept informed by proper devices not only of the position and direction of motion of every car, but also of the location of waiting passengers, and as to whether or not their signals have been properly answered. The satisfaction of the guests with the elevator service is largely dependent on the starter or dispatcher.

It may be that the time saved by these several means will amount to an interval, in which case either the same traffic can be handled by one less elevator, or the traffic capacity of a given number of elevators can be correspondingly increased. In high class hotels, an interval of 30 seconds is usually considered satisfactory. This means that during the perod of heaviest traffic, on the average, a car in each bank must leave the main floor every 30 seconds.

The determination of the proper number of elevators and their equipment for any case requires the consideration of so many factors that no definite recommendations can be given. The size of the cars depends entirely on the number of passengers they must carry. Thus, suppose that in a 30-second interval 12 passengers will wish to leave the lobby floor; then at least a car capable of carrying easily 12 passengers should be used if crowding is to be avoided. In hotels hand baggage is frequently carried in the passenger cars, and additional space must be provided for it.

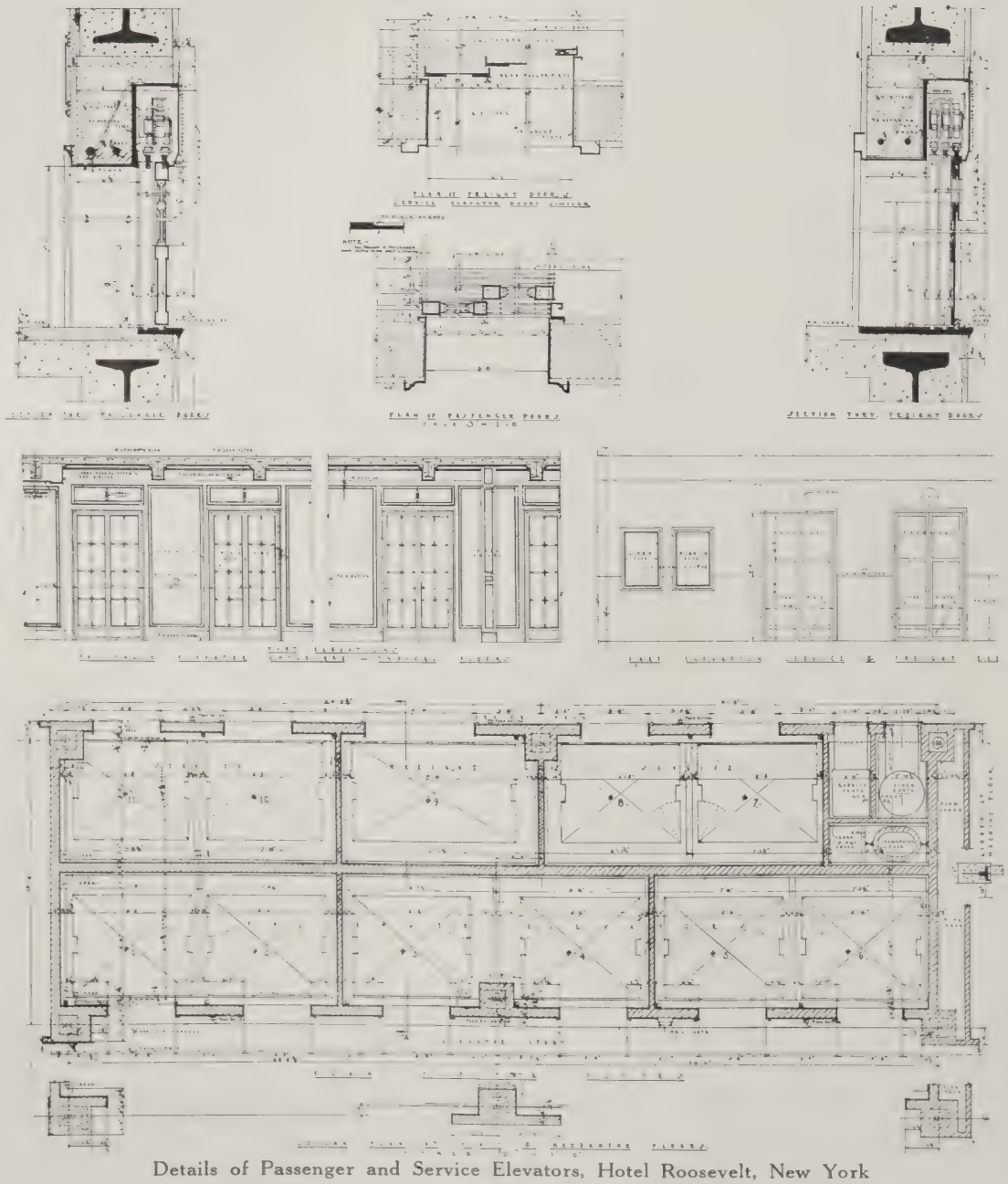
Wherever possible one should avoid running the guest elevators below the main or lobby floor, unless the service to such lower floors requires that every car stop at these floors on every trip. Otherwise the schedule will be constantly thrown out of balance and the service slowed down. It may be advisable to extend one car in each bank for emergency service—lame or sick guests. But such trips should be made only at the discretion of the starter or dispatcher. If there is a considerable demand for elevator service below the lobby floor it may be more economical to provide separate low-rise elevators to take care of it. The same is sometimes true of elevator service to a ball room. It may pay to provide low-rise ball room elevators, which may also serve other public floors not directly involved with the room guests. As far as possible, keep the general public and guests not occupying rooms out of the high-rise elevators serving the guest rooms.

Unlike office buildings, hotels have two entirely distinct classes of traffic—one for guests, and one for service, that must be handled by two entirely separate groups of elevators. The number and class of the service elevators are determined in the same manner as for the guest traffic, allowances being made for the differences in the two classes of traffic. If the room service is heavy and is handled from a centralized room service kitchen and pantry, the service elevator traffic will be correspondingly heavy. Indeed it may exceed the guest traffic. If

the service is to be prompt, obviously the service elevators must leave at frequent intervals. At the present time the tendency is to use service elevators of nearly the same, if not the same, number as the guest elevators and of the same operating characteristics and duty. There is a decided tendency toward increasing the number of service cars and eliminating dumbwaiters. It is probable that in very large hotels the room service can be speeded up by putting the service cars under the supervision of a dispatcher, precisely as is done with the guest cars.

In hotels all guest and service elevators should be furnished with car gates, the use of which should be compulsory, and all such elevators should have adequate car gate landing door interlocks. Over 80 per cent of elevator accidents are due to careless landing door operation.

For the low-rise elevators, baggage hoists, kitchen elevators, etc., in the basements, the rise, of which is short and the service more or less infrequent, the hydraulic plunger type is often useful and economical. Such elevators may be operated from the house tank, the waste being discharged into the sewer. If the house tank pressure is not sufficient or the service is heavy, or if the cylinders must be drilled in rock, the electric elevator may prove to be the most economical. If possible, "sidewalk lifts" should be avoided as they have caused many accidents.



Details of Passenger and Service Elevators, Hotel Roosevelt, New York
Geo. B. Post & Sons, Architects; Meyer, Strong & Jones, Inc., Engineers

Special Hotel Equipment

By ALVIN D. McLEAN

Supervising Engineer, United Hotels Company of America

THE hotel is a business institution organized to sell service to the public and return a profit to its stockholders. Equipment plays an important part in the operation of a hotel, and it requires careful and detailed study to determine the amount required and then to select the type that will most closely fit the needs of the hotel. Excessive equipment is a worse handicap if anything than too limited equipment, as it constitutes a steady drain on overhead expenses that the most careful supervision cannot overcome. The quality of equipment is another important consideration; cheap materials will inevitably involve high maintenance costs, and since satisfactory operation is so greatly dependent on service equipment, it is essential that only devices of recognized merit be permitted to enter a hotel.

Vacuum cleaning apparatus is essential equipment in all but the very smallest hotels. The system generally adopted includes an electrically-operated stationary plant, with machinery and motor selected to fit the exact requirements. The average sized plant operates on a 7½-h.p. motor; in selecting the motor it is important to bear in mind that it will operate more economically at 75 to 100 per cent capacity than it will at 25 to 50 per cent; it is better therefore to select a small motor and to arrange the cleaning schedule to keep it up to capacity when working. The machinery is installed in the basement with piped connections to the various floors. The accumulated dust and dirt are loaded into barrels from the machine and taken out with the ashes. If the hotel is equipped with an incinerator, the vacuum machinery should be located in proximity to it. Hose lengths of 50 feet are as large as can be conveniently handled for cleaning, and the outlets should be spaced along the corridor walls so that this length will reach all parts of the corridors and extend into the rooms without frequent changes of outlets or an excessive number. The vertical runs of piping can be accommodated in the bathroom vent and pipe shafts.

It is not necessary to provide a reserve unit because in the average city the necessary repair parts can be quickly secured, and portable electric machines will provide sufficient service during an emergency. From a point of convenience in operation it is always well to provide portable apparatus in addition to the stationary plant; there are occasional small rooms that are inaccessible from the

Scales in the Steward's General Stores, Pennsylvania Hotel, New York
McKim, Mead & White, Architects

Corridor of the Mount Royal Hotel, Montreal, showing telegraph counters and illuminated signs
Ross & Macdonald, Architects

main corridor without excessive lengths of hose and frequently special cleaning is required; in these events portable apparatus is useful. The public rooms and corridors are completely served by the stationary plant,, and the cleaning of these portions each day is done in a comparatively short time, after which the plant is shut down. The various rooms require attention as guests depart, and the maid on the floor can attend to this with a portable machine when it would not be convenient or economical to start the stationary plant.

The successful operation of any hotel requires quick and easy communication between the guest and the various service departments and between the departments themselves. The perfection of electrically-operated duplicating writing devices has greatly increased the efficiency of hotel service in this respect. Requests of guests for service are received by telephone and relayed by means of electrical connections in written order form to the particular department concerned; departures of guests are similarly announced to the housekeeper and the office, and when the room is in readiness for a new guest this fact is likewise properly recorded. Each of the various departments through the hotel should be equipped with receiving apparatus, and those at which orders originate with sending apparatus also. In hotels that have floor clerks the machines are located at the floor desks; in other cases it is in the maids' floor closet with a light signal over the door to call the maid's attention to the order, and a signal at the housekeeper's or other corresponding sending station to indicate that the message has been received. At one of the

Dish Washing Department and dish conveyers in Los Angeles-Biltmore Hotel
Schultze & Weaver, Architects

stations, usually the front office or the telephone switchboard room, the master machine is installed, where a permanent record of every message transmitted is kept.

In a large installation it has been customary to combine the main sending station directly with the telephone switchboard, but it has been found that this retards the handling of outside calls and that a better arrangement is a separate switchboard for the house messages, connected with a special circuit to the telephone switchboard, so that the telephone operators can switch to the message desk such calls as require orders. This method also has the advantage of saving time in the installation and reducing expense, because the combined switchboards are built specially and the rental charge is high.

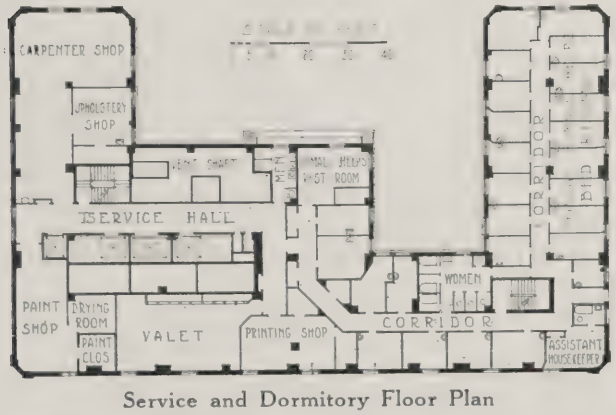
There are two types of message systems; one duplicates hand writing and is recorded on a continuous sheet of paper about 5 inches wide; the other records in typewriter form, and the message runs along a tape. The machines of the first system are supplied on a rental basis and must be operated on direct current; the machines of the other kind are purchased outright and can be operated on either kind of current. They each operate on current of 110 volts, and it is important that nothing else be placed on the same circuit, because the operation is delicate and any slight interference will cause trouble. When alternating current only is available and the first system is adopted, an individual motor generator set for transforming the current should be used.

In the larger hotels, where a system of floor desks working in conjunction with the main office desk is adopted, it is usual to install also a pneumatic carrier system. This is used for the dispatch of mail, telegrams, keys, etc., and in the large hotel reduces the number of pages and bell boys and eliminates considerable elevator traffic. The system is operated by compressed air, and due to its intermittent service the noise from the machinery is noticeable, and the compressor equipment should be located in the basement distant from any public rooms, but in easy relation to other machinery for the convenience of the engineer's staff. The incorporation of a pneumatic carrier service should be anticipated in the design of the building, so that proper shaft space with the straightest runs possible can be provided.

Other electrical equipment that must be considered in the development of plans for a hotel are fire alarm systems, watchman's and master clock systems, and telephone and telegraph service. The engineering and installation work for the latter services are supplied by the respective local companies, and sufficient notice must be allowed them for the preparation of wiring layouts so that the installation will conform to the building layout and proceed with the construction. In any extensive telephone service a special room for the operators' switchboard will be required; this is frequently arranged on the service floor or in the portion of the mezzanine floor given over to the hotel business offices.

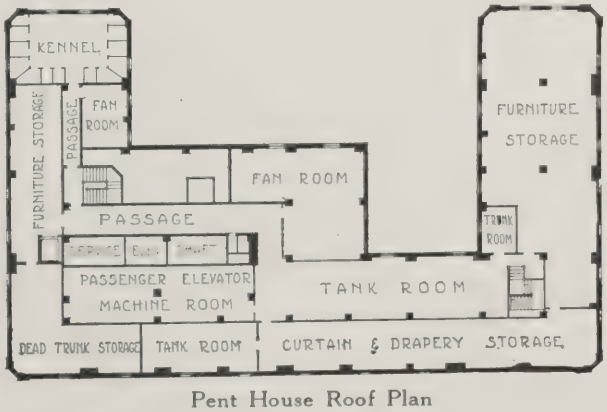
The watchman's clock system may be arranged in three ways: a portable clock with no electrical connections, which is of course the least expensive; an interior electrical system, and an outside electrical central station service. With the portable system, the watchman carries the clock and records his rounds with the key attached to each station. This system does not provide any supervision of the watchman except in the morning when the records of his clock are examined. The interior electrical system provides the recording of the watchman's calls at any designated point where supervision can be maintained. A practical arrangement when an absolute check-up is desired is the installation of an interior system with an outside station at the beginning and end of each route; the systems are wholly independent of each other, and failure to call the station will bring immediate notification from the outside service company. Such a system reduces the insurance rate, and it is worth having.

Fire alarm systems are similarly of two kinds,—interior and outside service. It is doubtful if the outside service is advantageous for a hotel; its cost is not covered by the resulting saving in insurance, and it always presents the possibility of an accidental alarm by an intoxicated person or a stupid and



Service and Dormitory Floor Plan

Shops grouped for efficiency and supervision; location on eighteenth floor insures light



Pent House Roof Plan

Note accessibility and space requirements for elevator machinery, fans and house tanks

Roosevelt Hotel, New York

excited employe, with the result that the arrival of apparatus frightens the guests without cause. A first class interior electrical system that will automatically indicate to the office and engine-room where a fire is, meets all the requirements.

Every hotel of any magnitude should have a well designed electric clock system. The master clock makes contact on relay, and the relays should be installed in duplicate to prevent breaks in the service. An excellent plan is to install also a cheap master clock for emergency use. The current for the clock system and the electrical alarm systems should preferably be from storage or primary batteries, unless a good source of outside current can be depended upon. The minimum voltage for this low-tension system should be 20 volts; this will also operate watchman's clocks, time stamps, push-buttons and similar devices. It is important that this system be installed with as much care as the lighting system; all wires should be run in conduits and the same grade of materials used as for the high-voltage system.

In the hotel of 500 rooms and more there is a constant problem of maintenance and repair work. With proper working space and equipment much money and time can be saved the management by having everything possible done within the building. The carpenter, machine, electrical and upholstery shops, particularly, should be given careful attention to see that adequate space is provided and that an equipment of standard machines capable of doing varied work is installed. The upholstery department is frequently placed at the top of the building to benefit by better light conditions; its location should be determined so that furniture and mattresses may be brought to it and back from the various floors with the least demands on the freight elevators. The other workrooms are best grouped together, either in the basement or on a service floor for easy control. In connection with the engineer's department in the basement there should be planned adequate storerooms for steam fitting, electrical, engine-room and boiler supplies.

Suitable provisions should be made for checking and weighing raw material that comes to the hotel. In the Mount Royal in Montreal, the most recently completed building of the United Hotels Company, a 20-ton auto truck scale is installed just outside the service entrance for weighing coal and other supplies delivered in large quantities, and a 2,000-pound indicator dial scale for weighing smaller quantities is located in the steward's general storeroom.

As a general convenience and aid to the engineering staff charged with the operation of the mechanical equipment a practical working scheme for identifying the various lines of piping in the shafts should be devised. This is perhaps most easily accomplished by color markings; different colors should be used to indicate hot and cold water lines, high-pressure and exhaust or low-pressure steam. In addition, the contractor installing the plumbing and heating plants should attach to each valve a tag with a number and statement of what it controls. A valve chart should then be prepared for the engineer's office, indicating by numbers the various valves, their locations and what they control. This procedure will greatly facilitate the location of trouble. The employment during the construction stages of the chief engineer is an insurance of careful and smooth operation to the management.

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Architectural Building Design Centers In the Windows

Interior of Suffern National Bank
Suffern, N. Y.

Alfred Hopkins, Architect
Fred T. Ley, General Contractor

Exterior view at top of page

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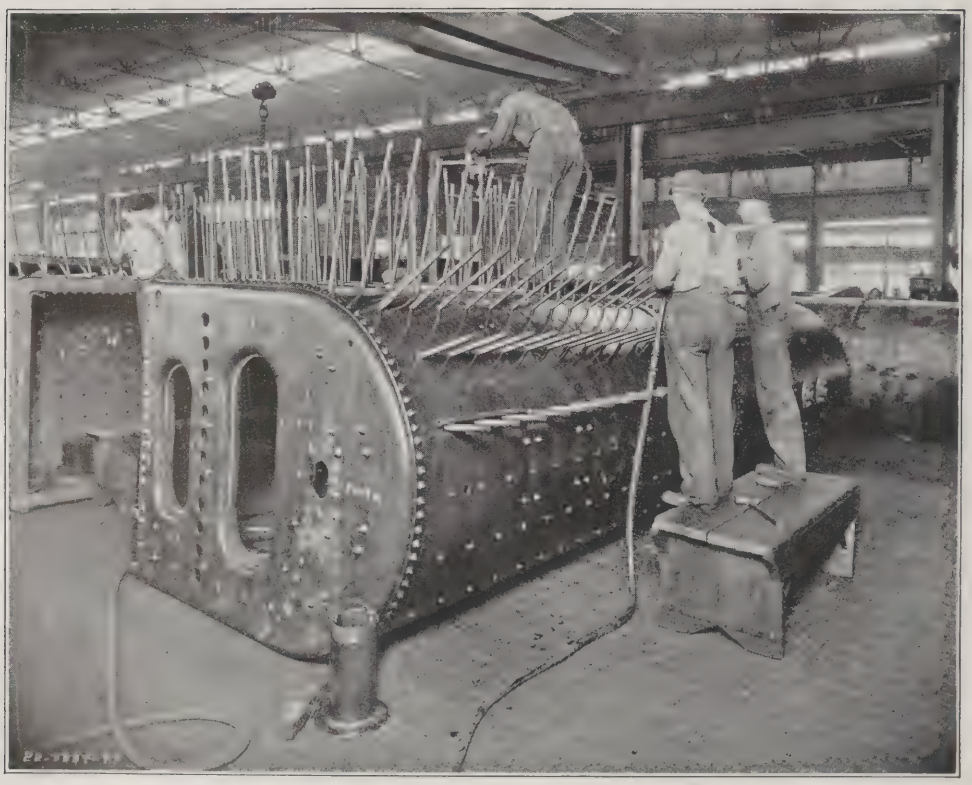

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Detail of Residence, Evanston, Illinois. Perkins, Fellows & Hamilton, Architects

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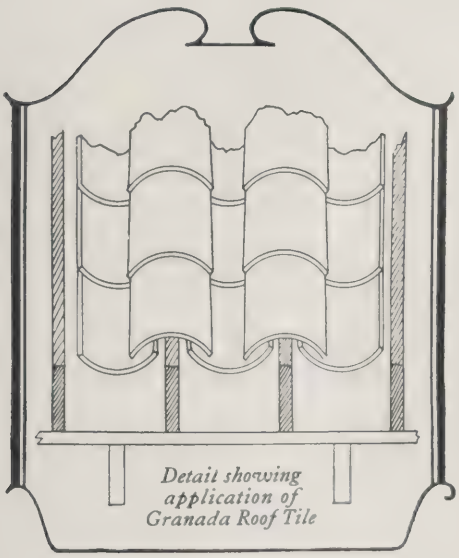

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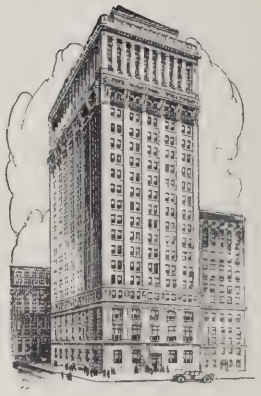

Views of the Cotton Exchange Building, New York. *Architect:* Donn Barber, New York.
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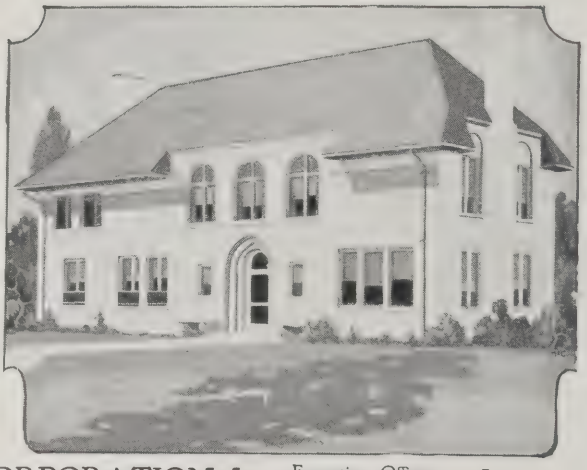

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- Instructions for Laying and Care of Linoleum
- Nairn Battleship Linoleum
- Plain Linoleum
- Tile Battleship Linoleum
- Lin Rhuber
- Nairn Cork Carpet
- Nairn Straight Line
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- Granite, Moulded, Moire and Plank Linoleum
- Sample Patterns.

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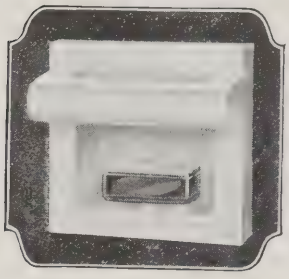
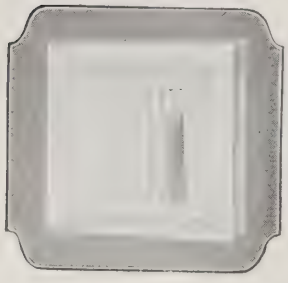
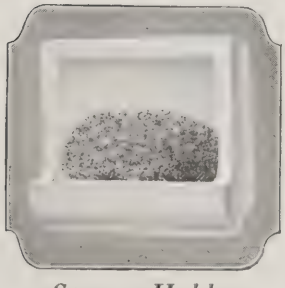
Why a *tiled* bathroom should have *china* fixtures



Combination Soap Holder and Safety Wall Grip



Tumbler Holder



Sponge Holder

FOR covering bathroom walls, tile is the accepted standard, but the fixtures built into these walls should be CHINA.

Tile fixtures, have a thinly glazed surface, which may craze within a few months. These cracks if filled with soap particles appear soiled and unsightly.

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DRAFTING ROOM DETAILS FOR TILEWORK

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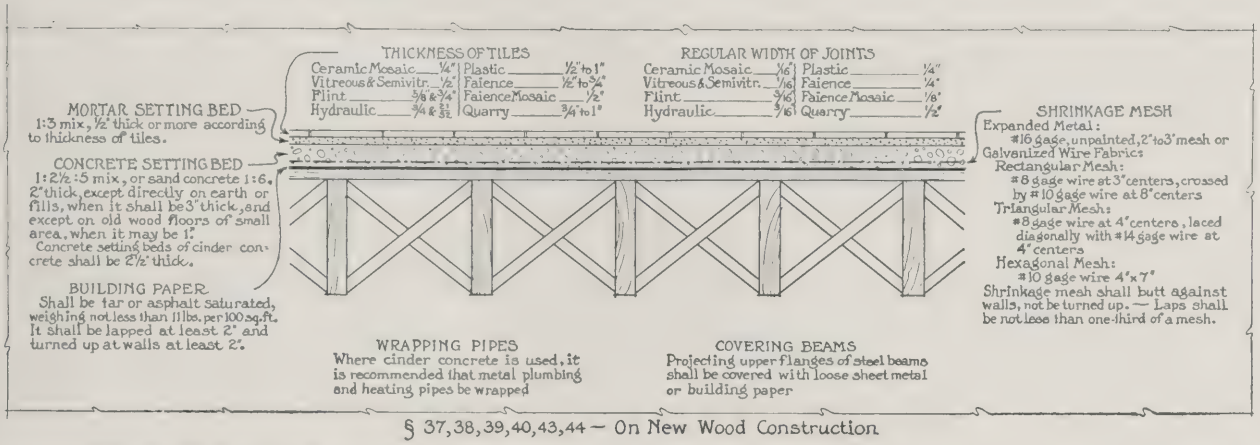
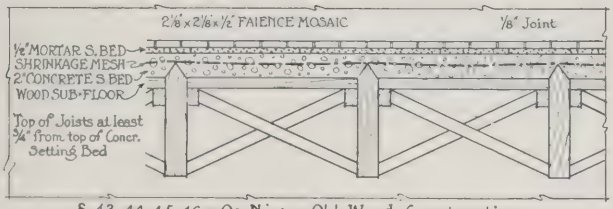
DATA SHEET FOR TILE FLOORS

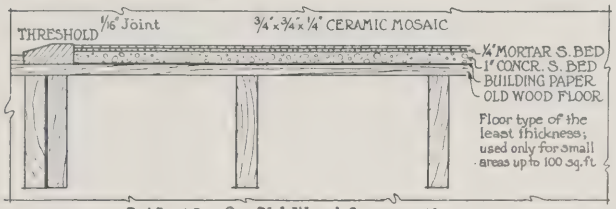
PREPARED IN ACCORDANCE WITH THE BASIC SPECIFICATION FOR TILEWORK



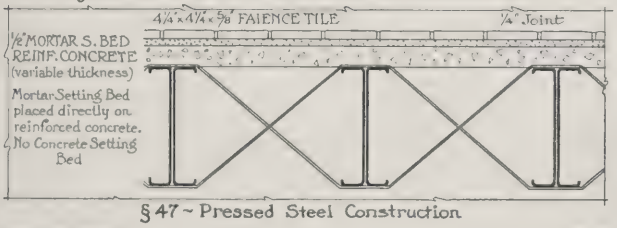
§ 37,38,39,40,43,44 — On New Wood Construction



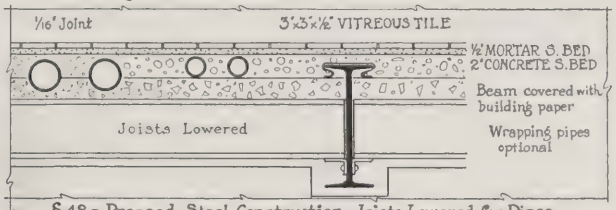
§ 43,44,45,46 ~ On New or Old Wood Construction



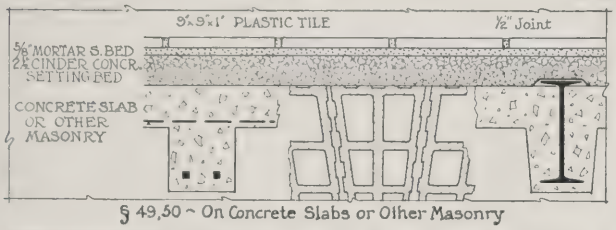
§ 45,46 ~ On Old Wood Construction



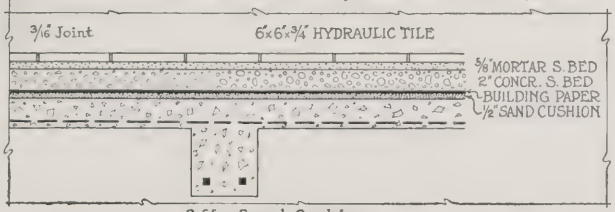
§ 47 ~ Pressed Steel Construction



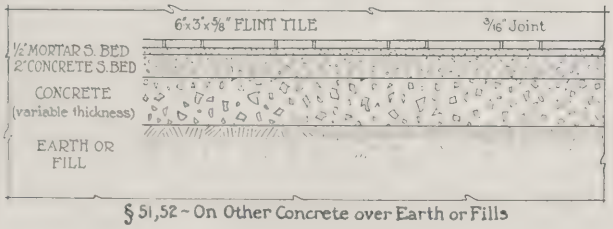
§ 48 ~ Pressed Steel Construction, Joists Lowered for Pipes



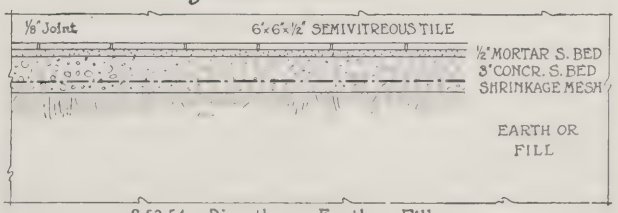
§ 49,50 ~ On Concrete Slabs or Other Masonry



§ 55 ~ Sand Cushion



§ 51,52 ~ On Other Concrete over Earth or Fills



§ 53,54 ~ Directly on Earth or Fills

Complete specificational clauses pertaining to the proper application of tile to floors of different types of construction may be found in our publication K-300 entitled "Basic Specification for Tilework." This document does not mention by name the product of any manufacturer of tile, but is a general document applicable to any kind of tile installation, and instead of avoiding modifications, definitely offers them. The Basic Specification for Tilework simplifies the work of the specification writer since it makes possible a practical blanket stipulation in the architect's specification providing for the furnishing of materials and the performance of tilework in accordance with a standard document to which bidders may be referred. A single paragraph will often suffice to accomplish this end. If not in your files, request a copy of this Basic Specification. Sent to architects on request.

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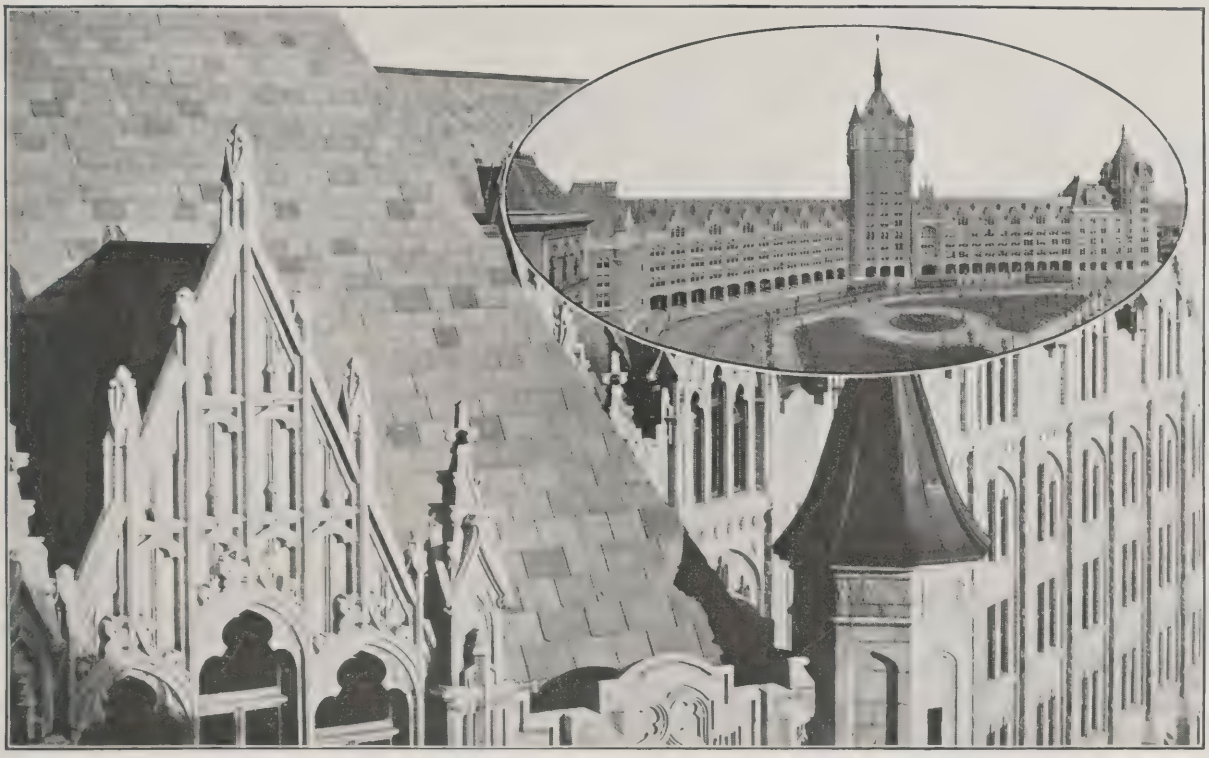

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(Marcus T. Reynolds, Albany, N. Y., Architect)

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Roofs
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Hearths
Mantels
Thresholds
Sills
Wainscoting

Bases and Plinths
Stairs
Risers
Landings
Vestibules
Porch Floors
Areaways

Garden Walks
Fountains
Benches
Coping
Bathrooms
Laundry Tubs
Laundry Trays
Toilet Partitions

Sinks
Septic Tanks
Black Boards
Drain Boards
Ice Box Shelves
Table Tops
Filters
Shower Stalls

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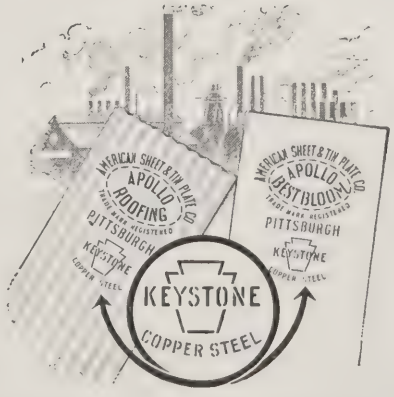

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FACTORIES
COLUMBUS, OHIO
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July
Thirteenth
1923

Ramspring Bumper Company,
Chicago, Illinois.

Gentlemen:

In the fall of 1911 we completed the erection of the main building of our Indianapolis factory. This building is 542 feet long and 87½ feet wide, and is covered with Federal Cement Tile roofing. This roof to date has given us but little trouble and in my opinion has proven up to their guarantee and has been satisfactory in every particular.

To date there has been but two leaks; in fact, the defects so far have been so trivial that they have hardly been noticable. There has been no maintainance expense due to the fact that what little upkeep we have had, has been taken care of by the tile company at their expense. We might also mention that our roof has been inspected by their representatives on different occasions and what few defects we have had, has been discovered by their people. The service rendered by them has been 100%.

Very truly yours,

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GMW:ML. Per. G. M. Weaver.

This letter, written to a concern interested in Federal Cement Tile, tells the story of Federal permanence and Federal service more convincingly than we can tell it.

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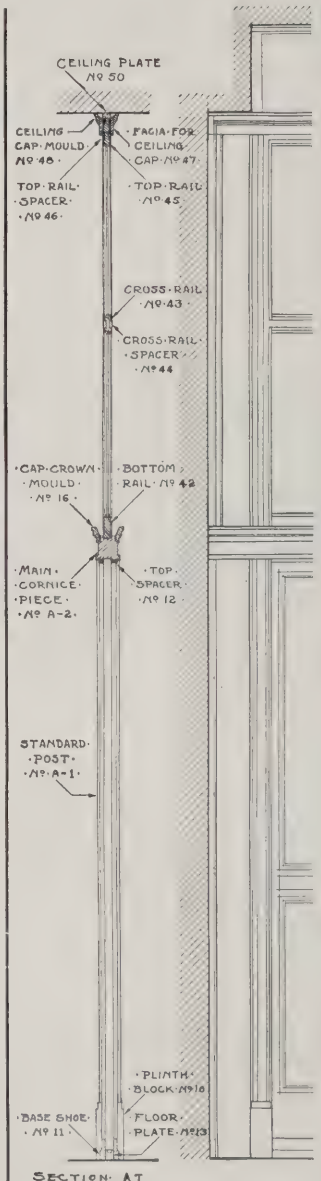
"The Roof for Permanence"



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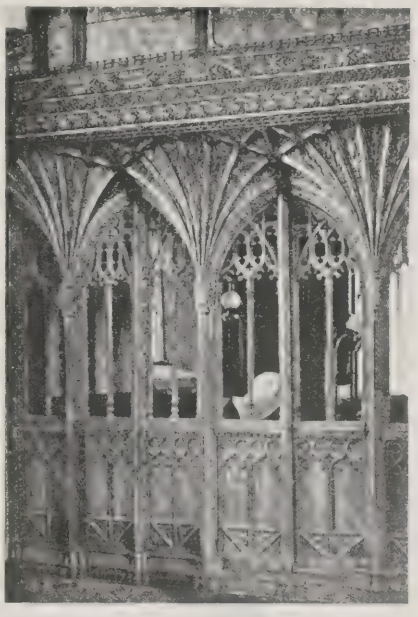
CIRCLE Ⓐ PARTITIONS

BOOK DEPARTMENT

ENGLISH CHURCH FITTINGS, FURNITURE & ACCESSORIES. By J. Charles Cox, L.L.D., F.S.A. Introduction by Aymer Vallance, 320 pp., 7 x 9 ins. Price $7.50. B. T. Batsford, Ltd., London. G. P. Putnam's Sons, New York.

WERE the history of the liberal arts ever written, it would include no chapter more glowing with interest and more brilliant in achievement than that recording the progress of these arts in England from the beginning of the fifteenth century to the time of the reformation. These arts thrive in the hands of a people of mixed descent, and by that time England had become well settled with a race derived from many stocks, the rich art instincts of the English, combining the best of various strains, being strengthened by ideas derived from the continent.

The arts, it will be noted, were enlisted very largely in the service of religion. It was before the time when royalty and nobility were building the great homes which came later, and the church fulfilled rather more than would be required of it later on; about it centered the life of the period, and the wealth of cathedrals, abbeys, convents and parish churches was being steadily increased by the donations of the living and bequests of the dead. One result of this lavish generosity toward religion meant the filling of religious edifices of all kinds with treasures of carving in stone or wood, with marvels of metal work, glass painted or stained, tapestry, embroidery, enamel, and examples of the work of all the crafts which were drawn into the service of the church.



Sixteenth Century Rood Loft
Atherington, Devonshire
From "English Church Fittings, Furniture and Accessories"

The inventories of this period read like pages from romance; the great shrine of Thomas à Becket, at Canterbury, was perhaps the richest in all Europe, wrought as it was of gold and silver and literally covered with precious stones, the gifts of generations of the faithful, and splendor more or less similar was repeated with modifications all over England. The very extent of the riches of the church excited the royal envy. History of the times records the dreary farce of laws of spoliation jammed through an unwilling parliament and the tragedy of the king's despoiler thundering at the convent gate or breaking down the doors of the parish church to rob the house of God of the gifts which had been accumulated during centuries. But with all their zeal, the despoilers overlooked much. Most of the greatest treasures, too famous to be overlooked, perished, but many an obscure parish church or convent chapel escaped with at least some of its treasures intact, or else such as were portable were removed to be hidden away and perhaps forgotten until discovered at a later day.

In this volume one who has written much on the subject of the handicrafts of England deals with such of the ecclesiastical treasures of the pre-reformation era as still exist. The list, while not complete, is of great extent, and Dr. Cox describes and illustrates the carvings of stone, or else of wood, in the form of screens, of canopies over fonts or choir stalls, the metal work and other objects with which the craftsmen of England filled the churches. The volume, admirably written and lavishly illustrated, possesses high interest and value for the architect who concerns himself with church work, and its publication will have its influence upon the training of taste in application to churchly use of these arts.

English Furniture—Its Essentials and Characteristics

By JOHN C. ROGERS, A.R.I.B.A.

With Foreword by H. Avray Tipping, M. A. F. S. A.

THIS excellent work on English furniture possesses the singular merit of being written for several classes of readers,—for the student, collector, or dealer, but even more particularly for the designer or reproducer of old English furniture, to whom are highly important the well drawn details with which the work is filled,—details of drawer construction; of stretchers and seat framings; of cornice profiles, or details showing the development of the cabriole legs of chairs and tables from 1695 to 1760. One page of these details would be worth to the designer or furniture maker more than the cost of the book.

It is a brief—but complete—work on old English furniture, splendidly written and well illustrated. 188 pp., 6x9 inches, bound in green linen, with decoration in gold.

Price $7.50, Postpaid

ROGERS AND MANSON COMPANY 383 Madison Avenue, New York

VENTILATION

Report of the New York State Commission on Ventilation

THE purpose of the field investigations of the commission was primarily to study certain specific promising and practicable methods of schoolroom ventilation. These investigations included a study of the physical conditions of the air under various methods of ventilation, and subjective results were secured through records of sensations of comfort and mental and physiological reactions of the occupants.

Nine individual field investigations were made by the commission. Typical fan and window ventilation methods were contrasted. The use of special types of air deflectors (window ventilators) combinations of air inlets and outlets, upward and downward ventilation, air distribution and air currents, humidification, and re-circulation of air all were specially studied.

The personnel of the commission and the chief affiliations of its members when appointed:

Professor CHARLES-EDWARD AMORY WINSLOW, Associate Professor of Biology, College of the City of New York; Curator of the Department of Public Health, American Museum of Natural History.

Mr. DWIGHT D. KIMBALL (of the firm of R. D. Kimball and Company, New York), a practical ventilating engineer.

Dr. FREDERICK S. LEE, Dalton Professor of Physiology, College of Physicians and Surgeons, New York.

Dr. JAMES ALEXANDER MILLER, Director of the Tuberculosis Clinic at Bellevue Hospital, New York; Professor of Clinical Medicine, College of Physicians and Surgeons, New York.

Professor EARL B. PHELPS, Professor of Chemistry, United States Hygienic Laboratory, Washington.

Professor EDWARD LEE THORNDIKE, Professor of Educational Psychology, Teachers' College, Columbia University.

It is believed that their report, now published in book form, constitutes a permanent contribution to the science of public health which must result in a general improvement of health and hygiene conditions, particularly among school children and those in public institutions, but also among the thousands who work in large buildings of any kind.

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ARCHITECTURAL COMPOSITION. By Nathaniel Cortland Curtis, A.I.A., Professor of Architecture and Head of the School of Architecture in the Tulane University of Louisiana; Professor of Architecture in the Alabama Polytechnic Institute. 250 pp., 7 x 9½ ins. Price $6. J. H. Jansen, Cleveland.

THERE is always a feeling of satisfaction experienced on coming upon a work written by one who has taught as well as practiced architecture. Its pages are likely to reflect the experience of years of practice,—the testing out and proving of theories and the securing of a judicious balance between the ideal and the practical,—and the experience which results from years of teaching, of instructing others in the art of thinking for themselves when once there has been secured the groundwork of understanding which must act as a foundation for any study of architecture.

Someone has defined architecture as "the art of building beautifully," and Mr. Curtis points out here that the primary difference between engineering and architecture lies in the clothing of utility with grace and beauty which is the function of architecture, and the use of utility without thought of the appearance of the structure and with little or no thought of its possible effect upon the mind of the observer, which is the purpose of engineering. The writer draws attention to two structures, comparatively well known, to point out this fundamental difference,—the Manhattan Bridge, certainly a work of architecture, and the Williamsburg Bridge, just as certainly a piece of engineering, though both structures serve precisely the same function. This clothing of the nakedness of utility with garments of beauty was not entirely overlooked by the ancients. The Romans, for all their devotion to what is ordinarily regarded as engineering, managed to give their aqueducts, baths or arenas a certain grace of form, a simplicity and directness of expression which never for one moment led an observer to suppose a structure to be anything other than what it was. Much of this use of grace of form is to be noted in the work of certain architects practicing in America today. Many a huge warehouse or factory building or else a structure such as a stadium or viaduct by reason of its fine simplicity of form and line, worked out in materials which are often the least expensive, points out the difference between engineering and architecture.

Mr. Curtis' excellent and helpful book has a use which is not limited to the classroom or to the service of those who are some day to become architects. It possesses an appeal to that broad and continually growing body of public opinion in which interest in architecture has been awakened and is waiting to be trained and directed to the point where enlightened interest becomes intelligent and discriminating appreciation. Nothing is more necessary if architecture is ever to attain to a period as prosperous as existed say in Georgian England, possible only by reason of there being many enlightened amateurs, when a gentleman's education presupposed rather more than a bowing acquaintance with architecture. With this end in view the author discusses the "Nature of Architecture," the fundamental æsthetic laws of architecture, and architectural creation. Another chapter takes up the "Elements of Architecture" and such subjects as the orders, walls, doors, windows, porticoes, arcades and vaults. Under the "Elements of Composi-

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tion" Mr. Curtis discusses the treatment of the plan proper, and so on with all the departments of designing and planning, one helpful part toward the end discussing the treatment of sites and the matter of orientation. All these chapters are illustrated by a great number of drawings, some being of buildings of the antique age while others are of structures completed in New York or elsewhere in America within the last few months. A volume of this character is valuable in that it leads the reader, almost without his knowing it, into wider reading and study. It presents many points of contact with related arts, such as painting and sculpture, and many also with decoration in divers forms, and all this enhances the value of the work for many purposes.

SIR CHRISTOPHER WREN'S BICENTENARY: 1723-1923. Memorial Volume. Lavishly illustrated. American Editions: Subscribers' Edition, $30, net; Edition de Luxe, $50, net; Edition Limited to 25 Copies, Bound in Leather, $150, net. Hodder & Stoughton, London.

THE year which saw the commemoration of the 200th anniversary of the death of Sir Christopher Wren records many tributes to the skill of that great master builder. England claims him, and rightly, among her eminent sons, but in a special sense he belongs to the entire English-speaking people scattered and dispersed throughout the world, and countless societies of architects in many lands have paid in one way or another the tribute of their admiration for the man and their reverence for his great achievements.

But perhaps when another century has passed and the record of many tributes has perished, and architects of 2023 are paying their tributes to Wren's great name it will be found that the one most lasting relic of the bicentenary is a volume issued in commemoration of the event under the direction of the Royal Institute of British Architects. This great volume, magnificent in its contents and sumptuously made, might be described as a memorial volume of essays regarding various aspects of the life and work of Sir Christopher Wren.

The work, as might be expected, covers the life of Wren and his most important work, particular emphasis being given to St. Paul's. In addition to the interest added by the inclusion of numerous plates in full color there is that given by the reproduction in facsimile of drawings and letters from the hand of Wren himself.

THE PLANNING OF THE MODERN CITY. A Review of the Principles Governing City Planning. By Nelson P. Lewis. Illustrated. Second Edition, Revised. 423 pp., 6 x 9 ins. Price $5. John Wiley & Sons, New York.

CRITICISM is frequently made of the ragged and uncouth appearance of American cities, and particularly of their almost entire lack of what might be called a definite plan, and travelers are given to drawing comparisons between certain of the European capitals, Paris and Vienna, for example, and American cities such as New York or Chicago, comparisons not at all flattering to the American cities.

Of course the ideal city would be definitely planned from the beginning, and its "zones" would be well drawn, even though provision were made for considerable expansion and consequent overlapping of these districts. But the critics hasten to remind us that Paris has been developed from a dozen or more primitive villages, and that its present symmetry and well

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ordered dignity are the results, not of a beginning upon definite lines, but of triumph over untold obstacles; and they point out the difference between the development of Paris during the past 20 or 30 years, with its excellent arrangement of avenues and streets and comparatively harmonious buildings, and the upbuilding during the same period of any American city, with its streets planned upon a "checker board" system, and buildings which suggest chaos given structural form.

The truth of the matter is that the dignity of most European cities is due chiefly to the control or supervision which government has been able to exercise over their development,—to the power of national or municipal laws to regulate building, to alter the arrangement of streets, and even to create new streets, squares and open spaces where they are desirable. Little of such governmental control is possible in America, and since private initiative almost always follows the course pointed out by private advantage or profit, it has been found difficult, if not impossible, to enforce even such provisions as really exist. It might seem, too, that with the growth of democracy or "popular government" there comes a consequent weakening of the power of the state or municipality to effectively supervise. The present government of France, for example, might have considerable difficulty in forcing any such rearrangement of Paris as was so easily done by the architects and town planners of Louis XIV; the ragged appearance of certain parts of London and the destruction of Regent street now going on might not have been so complacently endured in the days of the autocratic Georges, while in America, where Democracy, theoretically at least, is supposed to sit enthroned, and where there are few or no laws upon the subject of planning or carrying out urban development, the lack of control is reflected in the chaos which exists practically everywhere.

In this volume, a new and somewhat altered edition of that published some years ago, Mr. Lewis supplies excellent advice regarding the building and developing of cities. The last few years have brought into effect the provisions of "zoning" systems which are now in force in many cities, while many other cities are reported to be watching the results with a view to enacting zoning ordinances of their own, and some of the benefits to be derived from these laws are dwelt upon here.

LIFE ON A MEDIÆVAL BARONY. By William Stears Davis, Ph.D., Professor of History in the University of Minnesota. 414 pp., 5½ x 8 ins. Price $3.50. Harper & Brothers, New York.

FOR the architect there is much of interest in this historical study in which the author visits in spirit a barony situated in the Ile de France not a great distance from Paris. The time is that greatest of centuries, the thirteenth, when the Gothic period was in its flower and when over all France the master builders were rearing their cathedrals and abbeys. A vivid account is given of the organization and workings of the feudal system as it then existed and life on a barony as it was lived at that time. The architecture, dress and customs of the period are portrayed, and descriptions are given of a mediæval fair, a wedding at the baron's castle, and the ceremonies attending the knighting of a son of the house. An admirable study of a time when architecture was inextricably interwoven with the lives of the people.

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THE ARCHITECTURAL FORUM

VOLUME XXXIX NUMBER 6

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ALBERT J. MacDONALD, Editor

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THE EDITOR'S FORUM

HOUSE BEAUTIFUL COVER COMPETITION

THE success of the competition for cover designs held last year has led the *House Beautiful* to repeat this event and again to offer two prizes, one of $500 and one of $250 to the successful contestants. The competition closes February 9, 1924. Full particulars regarding the competition may be had on application to the Competition Committee, House Beautiful, 8 Arlington street, Boston.

SMALL HOSPITAL COMPETITION

WITH a view to placing them on record in accessible and permanent form, the publishers of the *Modern Hospital* have issued a brochure containing the designs and plans received in its recent competition for plans for a general hospital having from 30 to 40 beds.

The general program was announced in the fall of 1922, and 51 plans were submitted. The jury of award was headed by Dr. S. S. Goldwater, Director of Mount Sinai Hospital, New York, Chairman. The jury met on March 6 and 7, and after a painstaking examination of the plans, made these awards: First Prize, Butler & Rodman, New York; Second Prize, John J. Roth, Los Angeles; Third Prize, Ernest Hoedtke, Cambridge, Mass.; First Honorable Mention, Cervin & Horn, Rock Island, Ill.; Second Honorable Mention, L. C. Dillenback, Urbana, Ill. The brochure is valuable to architects.

THE TRAINING OF APPRENTICES

RECENTLY the American Construction Council announced the creation of a Committee on Apprenticeship, Vocational Guidance and Craftsmanship, with F. W. Walker, Secretary of the Associated Tile Manufacturers, as its chairman. Announcement of part of the personnel of this committee is now made. The list includes the names of many well known architects from various parts of the country, of representatives of other professions, and of various associations of employers.

In addition the different bodies representing labor have been asked to nominate representatives upon this important committee of the council. It is expected that a meeting of the committee as a whole will be called shortly, probably in Buffalo, the week of December 6. The individuals and representatives of organizations there assembled will help in the further development of apprenticeship in the construction industry through the appropriate agencies of the council co-operating with all the organizations within the industry. Any other association vitally interested in this subject is invited to write the American Construction Council, at 28 West 44th street, New York, which is its permanent headquarters, and to which communications are addressed.

OTHER effort in this direction is recorded by the Boston Society of Civil Engineers. The November issue of its *Journal* gives an account of its meeting on September 19, when the general topic of discussion was "Apprenticeship in the Building Trades of Boston," with addresses by William Stanley Parker, George Thornton, Heywood S. French, James M. Gauld, and also by Frank M. Gunby, who in addition to being president of the Boston Society of Civil Engineers is a representative of the Boston Building Congress on the Apprenticeship Commission.

In order to cover the subject as thoroughly as possible it was arranged to have four speakers discuss the matter from as many different points of view. Thus the subject was treated from the standpoint of the Boston Building Congress by Mr. Parker, its president, who is also president of the Commission on Apprenticeship and vice-president of the American Institute of Architects; Mr. Thornton, the second vice-president of the Bricklayers, Masons and Plasterers' International Union of America, spoke as a representative of a craft which suffers greatly from seasonal unemployment; the point of view of the Building Trades Employers' Association was expressed by Mr. French, the association's representative on the Commission on Apprenticeship, while the matter was considered from still another angle by Mr. Gauld, the secretary of the Massachusetts State Council, United Brotherhood of Carpenters and Joiners of America, and a member of the Apprenticeship Commission. Before the end of the meeting there was a general discussion.

One point in Mr. Parker's address should be noted as suggesting the spirit in which the apprenticeship problem must be approached if it is ever to be really solved. In speaking of the Boston Building Congress, Mr. Parker said: "It is made up of architects, engineers, contractors, subcontractors, labor men, material men, material producers and building investment men. These eight principal elements in the industry comprise the Building Congress, and anything which comes out of the deliberations of the congress comes out of the deliberations of all these elements, who have been present and have discussed the thing frankly, with all their cards on the table. And you have no idea what a good effect it has had on all of us to discuss things under those conditions. Any two habitual rivals may get together in a room and fire a lot of 'buncombe' at each other. But let them discuss the same subject with four or five other elements of the industry present, and that has the admirable result of eliminating the buncombe and in getting them down to brass tacks. They know what the others think, and hear them discuss matters freely in open meeting, and this has a very healthy effect on everyone concerned."

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The
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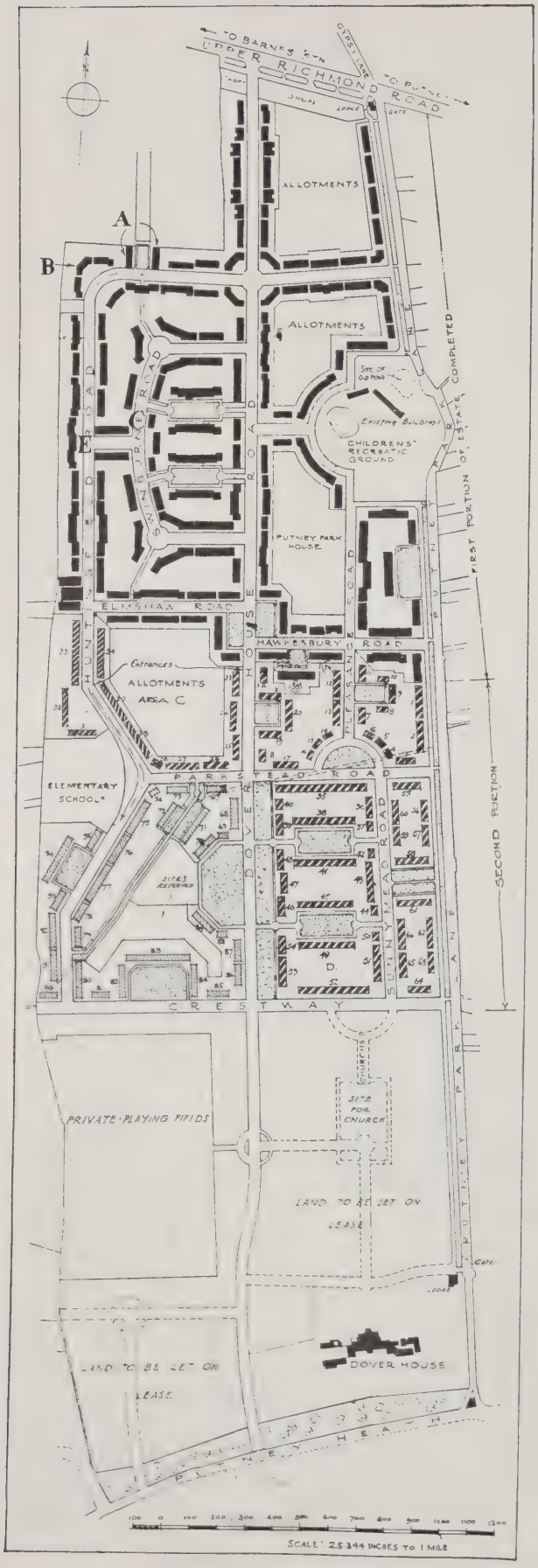
VOLUME XXXIX DECEMBER 1923 NUMBER 6

Some London Housing Developments

By H. J. BIRNSTINGL, A. R. I. B. A.
Late Assistant Architect, Ministry of Health

IT may be said that now in England we have definitely emerged from a period in which all considerations for town planning were for the time ignored. For it is a fallacy to think that town planning is a new activity. History reveals it as one of the very earliest of the arts and sciences, and the country is rich in evidence of careful forethought having been expended upon the development of many of its oldest towns. Notable periods of town planning activity occurred in the reign of Edward I in the twelfth century, and again the eighteenth century, which gave us the West End of London as we know it today. During the nineteenth century, however, the country was swept by the forces of the industrial revolution; old towns developed and new ones grew up in thoughtless haste. Today we are paying the penalty for this, both in national health and national wealth, but the pursuit of town planning has once more emerged from its obscurity. A study of it leads to the conclusion that no one aspect of the town can be considered by itself, but that all urban problems are intimately connected with one another. As Professor Abercrombie, one of England's foremost town planning experts, has somewhere pointed out, mistakes in the past have often occurred through the isolation and concentration on one particular aspect of the matter. It may be a concentration of subject or locality; thus the question of housing may be considered independently of its relation to such matters as traffic or

Cottage Close, Huntingfield Road, Roehampton Estate (A on Plan)
G. Topham Forrest, Architect

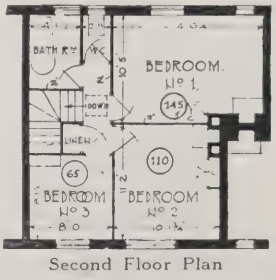


General Plan of Roehampton Estate

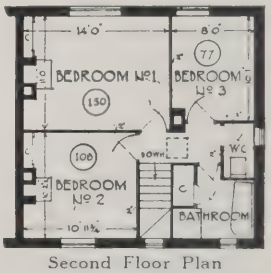
open spaces, or a small area may be considered independently of its relation to the surrounding area. Both these methods lead ultimately to disaster, and this is one of the most important doctrines which the modern town planning movement has brought to acceptance.

The question of housing in London is particularly complicated. There is not only the necessity of providing enormous additional accommodation, but there is also the equally urgent necessity of dealing with unhealthy and overcrowded areas. And here again, whereas in many other towns when it is not possible to re-house the whole population of an unhealthy area on the same site owing to overcrowding, it is often possible to house the surplus population on the outskirts of the town where land may be available; in London this cannot be done, since many classes of workers, such as dock laborers, market porters, and the like, must be moderately near their work. The outskirts of most towns are within walking distances of their centers, but in London this distance may well be eight miles. Thus, although this article deals mainly with two housing schemes of the London County Council, it must be borne in mind that these schemes form part of a vastly complex whole, nothing less indeed than the future development, in all its manifold aspects, of London.

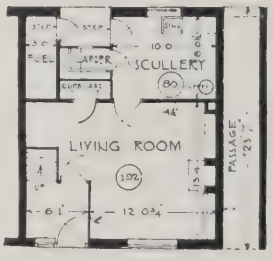
The housing program of the London County Council was formulated in June, 1919, seven months after the armistice, and it included the provision, within five years from January, 1920, of 29,000 new dwellings, exclusive of those to be erected on the cleared sites of unsanitary areas. This in itself, at five persons per house, is sufficient to accommodate a good-sized town's inhabitants. The estimated capital expenditure to be incurred in the acquisition



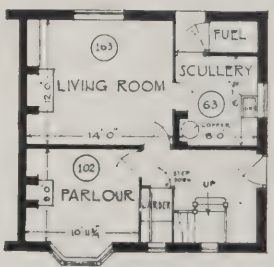
Second Floor Plan



Second Floor Plan



First Floor Plan
Four-Room House
S. or E. or W. Aspects
Area: 399 Feet



First Floor Plan
Five-Room House
N. or E. or W. Aspects
Area: 475 Feet

Typical Houses in Roehampton Estate

Group Houses in Bend of Huntingfield Road, Roehampton Estate (B on Plan)
G. Topham Forrest, Architect

of the sites, their layout and the erection thereon of the cottages, was approximately £24,000,000. About 2,000 of the houses were to be erected on partially developed sites, the remainder on the new estates at Roehampton, Bellingham and Becontree. Before the work could be begun it was necessary to make adequate arrangements for dealing with the difficulties arising through shortages of labor and materials. It was estimated, for example, that 700,000,000 bricks would be required in the course of the five years, and 300,000 tons of cement. The total average daily requirement of material was 4,000 tons. These are big figures and may convey some idea of the magnitude of the task. Yet despite all these and other difficulties the first of the new post-war houses were finished on February 7, 1920,

View Looking North on Swinburne Road, Roehampton Estate (C on Plan)
G. Topham Forrest, Architect

Cottages on Huntingfield Road, Roehampton Estate (E on Plan)
G. Topham Forrest, Architect

and since that date, up to the beginning of this year, dwellings have been completed at an average rate of seven per working day.

The Bellingham Estate has 2,090 dwellings and is one of the largest state-aided housing schemes in the country approved by the Minister of Health under the Housing and Town Planning, etc., Act, 1919. The area comprises 252 acres, and it was purchased by the council at a cost of about £200 per acre. The actual housing site consists of 176.5 acres, the remainder of the land being utilized for market gardens, and for houses not of the working class type.

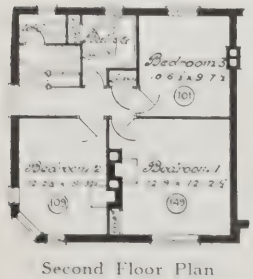
Modern ideas as to the requirements of a housing estate have undergone a change during the last few years, and it is now realized that it is the duty of the housing authority to provide not only houses but facilities for various amenities and activities. Of the 176.5 acres, therefore, only 107 are actually taken up by cottage building sites and minor open spaces, the remainder being devoted, in addition to roads, to allotment gardens, tennis courts, open spaces, school, church and shop and public building sites. Provision is made for 220 allotments, 26 tennis courts, and two schools, each for 1,024 pupils.

The housing site is triangular in shape, the layout being logically concentrated on a central green around which are grouped the most important public buildings. The accommodations vary from two-roomed flats to five-roomed houses; all are provided with bathrooms and hot water systems. The houses are constructed with 11-inch external cavity walls, internal walls of coke-breeze (cinder) concrete, wood floors and roofs covered with Welsh slates, English tiles, and French interlocking tiles.

The Roehampton Estate is perhaps one of the most charming in the country. It is very much smaller than the Bellingham Estate, and as yet only the first section has been finished, although work on the second has now been begun. Despite the variety in treatment there is a sense of unity in the scheme and a welcome suggestion of openness. The estate is 147 acres in extent, of which 94 have been reserved as a housing area, including also sites for schools, shops, and open spaces for public uses.

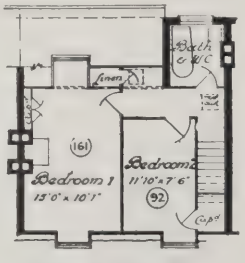
The first portion of the estate, which has now been developed, comprises 624 cottages and "maisonettes," the cottages having from three to five rooms and the "maisonettes" two and three rooms. The first school, which will ultimately accommodate 996 boys and girls, is in course of erection. This is an elementary school. There will eventually be a secondary school for which a site of five acres is reserved.

The Roehampton Estate contains many fine old trees, and the layout has been arranged so as to take the fullest advan-

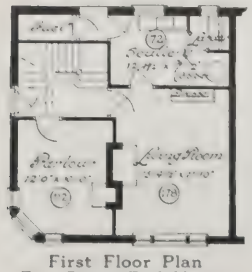


Second Floor Plan

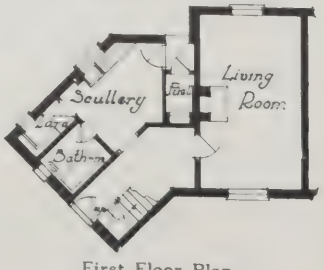
Second Floor Plan



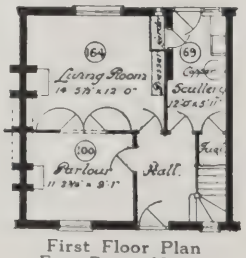
Second Floor Plan



First Floor Plan
Five-Room End House
South Aspect
Area: 505 Feet



First Floor Plan
Four-Room End House
Area: 444 Feet



First Floor Plan
Four-Room House
North Aspect
Area: 445 Feet

Typical Houses in Bellingham Estate

View East on Broadmead, Bellingham Estate (D on Plan)
G. Topham Forrest, Architect

tage of these and other natural features. The roads are laid out in accordance with modern ideas, rather than on the old system which insisted upon a 40-foot road irrespective of whether such width was actually required or not. Although a distance of at least 70 feet is maintained between houses, the carriage way itself is now designed in accordance with the amount of traffic it is likely to have to accommodate. This gives opportunity for variety in the grouping of the houses, and courts, closes, *cul-de-sacs,* and such arrangements become possible. Vistas are achieved and often closed by some modest architectural feature, such as a well designed doorway or gable or some especially designed building.

As for the houses themselves, they rely upon good proportions, good materials properly handled, care of detail, and thoughtful grouping. For the most part they are quite plain, the plan dictating the form, and economy ruling as it were throughout, but they are always good architecturally.

A few facts concerning the cost of these houses may be of interest, and these paragraphs are taken from the auditor's report of the Bellingham Estate. They suggest the economy exercised.

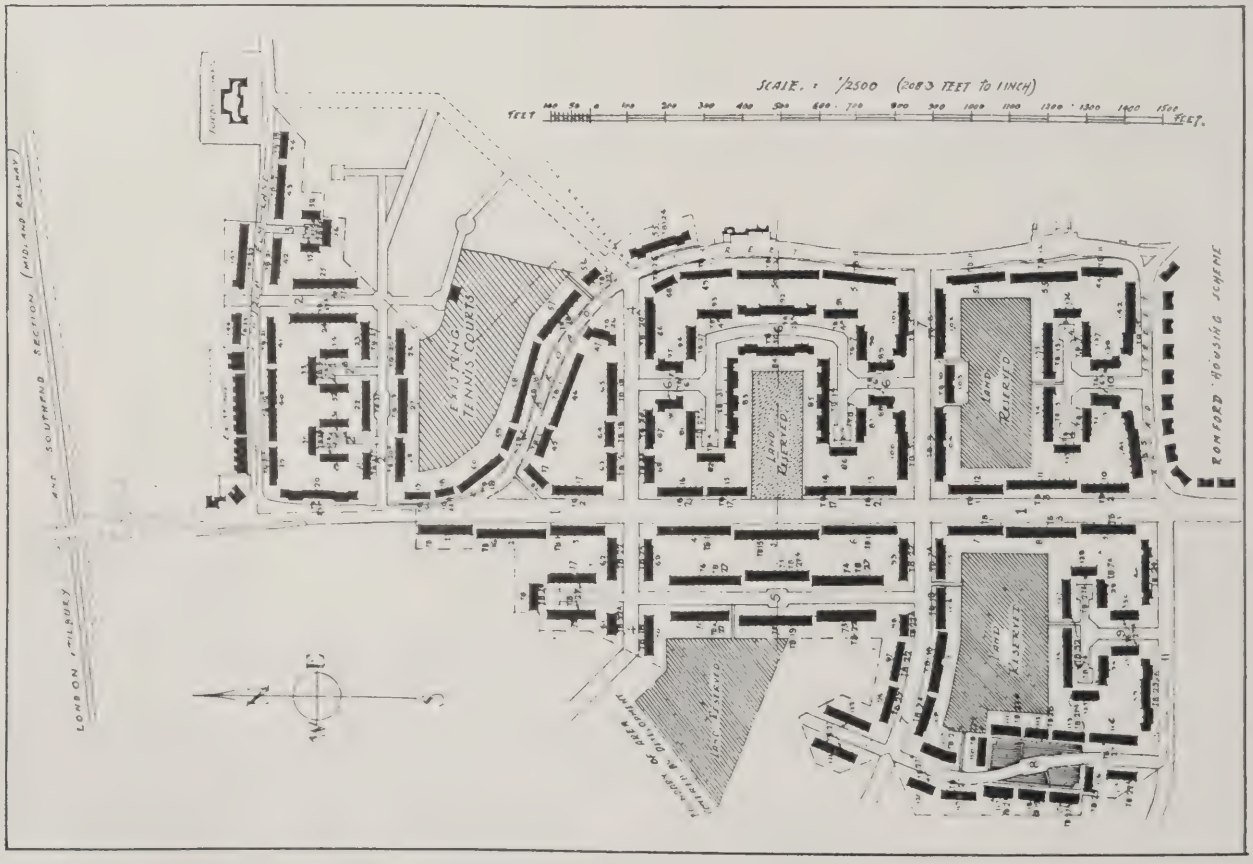
General Plan of Bellingham Estate of the London County Council
G. Topham Forrest, Architect

"The eventual cost of the dwellings is not readily ascertainable; the stocktakings and valuations have been carried out on the two anniversaries of the order to commence the undertaking (October 23, 1920), and these afford some basis for computation of the houses already erected; the approximate average cost per house may be taken at £900, excluding expenditure on purchase of site, construction of roads and sewers, and also establishment charges met through the central office.

"This figure must be taken as subject to revision when the contract is completed, and it should be noted that the cost of building has fallen since this figure was calculated and that houses are now being constructed at a lower cost than in the year under review."

The Roehampton Estate is more recent, consequently the cost is considerably reduced. Since 1920 there has been a steady fall in building costs, and the average cost of the 168 houses, comprising those of three and four rooms is £378, exclusive of roads and land.

These and similar estates represent, indeed, the most significant contribution to architecture of the day. Here and there may arise a few individual buildings of outstanding merit, but in these estates is seen the determination of the mass of the people to live in healthier and more beautiful surroundings, and its recognition on the part of the government. Although from about 1910 serious attempts were made to improve housing conditions and to introduce a new and more comfortable type of home for the working classes, the war period marks the real dividing line between the old and the new order. It unquestionably redounds to the credit of municipalities and local authorities that they should have succeeded where private enterprise undoubtedly failed. For although, in the past, the number of houses may have been more adequate than it is today, the quality was certainly infinitely inferior. A contrast between the dismally monotonous districts which grew up at the end of the last and the beginning of this century, with their endless repetition of a single type of house, designed and placed without consideration of aspect, and where it was thought that all essential shortcomings were compensated for by the reckless application of utterly meretricious ornament, with one of these estates, with their comfortable and dignified houses will show the immensity of the advance. And in this matter, if London has not actually led the way she has marched with the van, and, moreover, her difficulties, as has been shown, are far more complex than those of any other city. Among those to whom praise is due none perhaps deserves it more than the Council's Architect, G. Topham Forrest, F.R.I.B.A., who is responsible, not only for these schemes, but also for all clearance and re-housing work.



General Plan of Becontree Estate of the London County Council
G. Topham Forrest, Architect

ITALIAN RENAISSANCE DETAILS

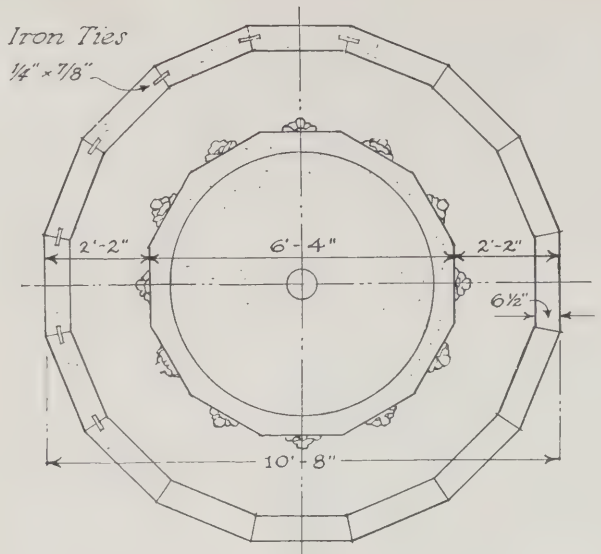
A SERIES OF MEASURED DRAWINGS

By HOWARD MOÏSE

EARLY RENAISSANCE FOUNTAIN, PALAZZO DEI PAPI, VITERBO

IF closely analyzed, it will often be found that the excellence of Italian architecture is due in large measure to restraint in design, which provides simple ornament of fairly vigorous scale used in connection with plain but well textured surfaces to afford contrast.

The success which follows such wise use of ornament may be judged from this fountain which stands in the courtyard of one of the old palaces at Viterbo, a town which still possesses many buildings of the early renaissance period. Like most of the old Italian fountains it consists of a basin which rests upon a pedestal, forming the fountain proper. This is surrounded by a larger basin, resting upon the ground, into which the overflow falls. The rim of the upper basin develops a 12-sided edge, while the lower basin is 16-sided, the angles thus formed adding a note of simplicity and strength which would have been wanting had the basins been circular. The ornament of the upper basin consists of a series of 12 lion masks and the simple capital of the supporting pedestal or shaft, while the sole ornament of the lower basin are the graceful proportions of the 16 panels of which it is formed.



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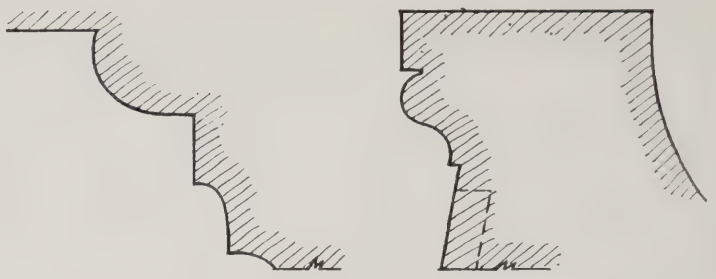
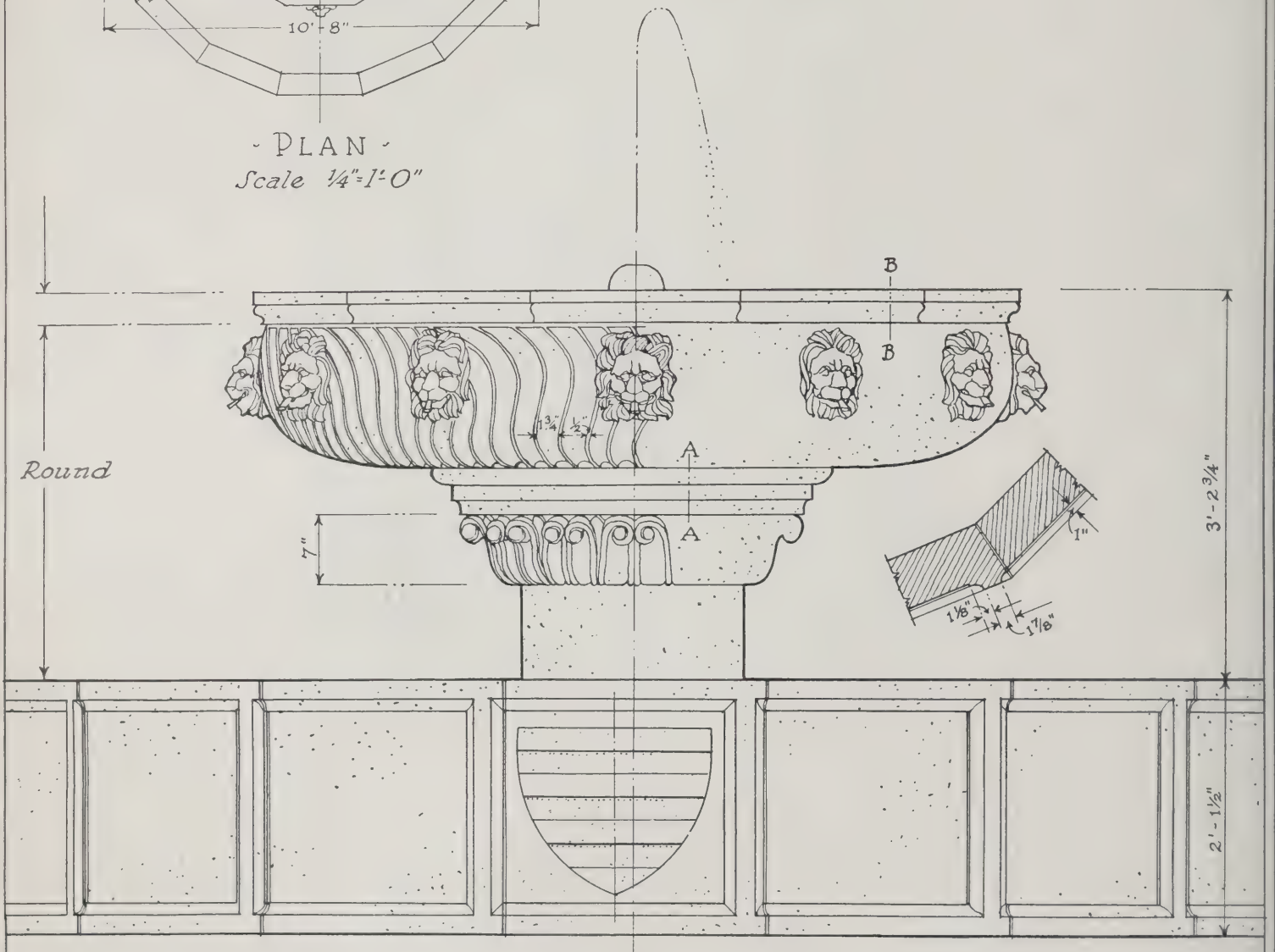
Scale ¼"=1'-0"



- SECTION A-A - SECTION B-B -
Scale 3"=1'-0"

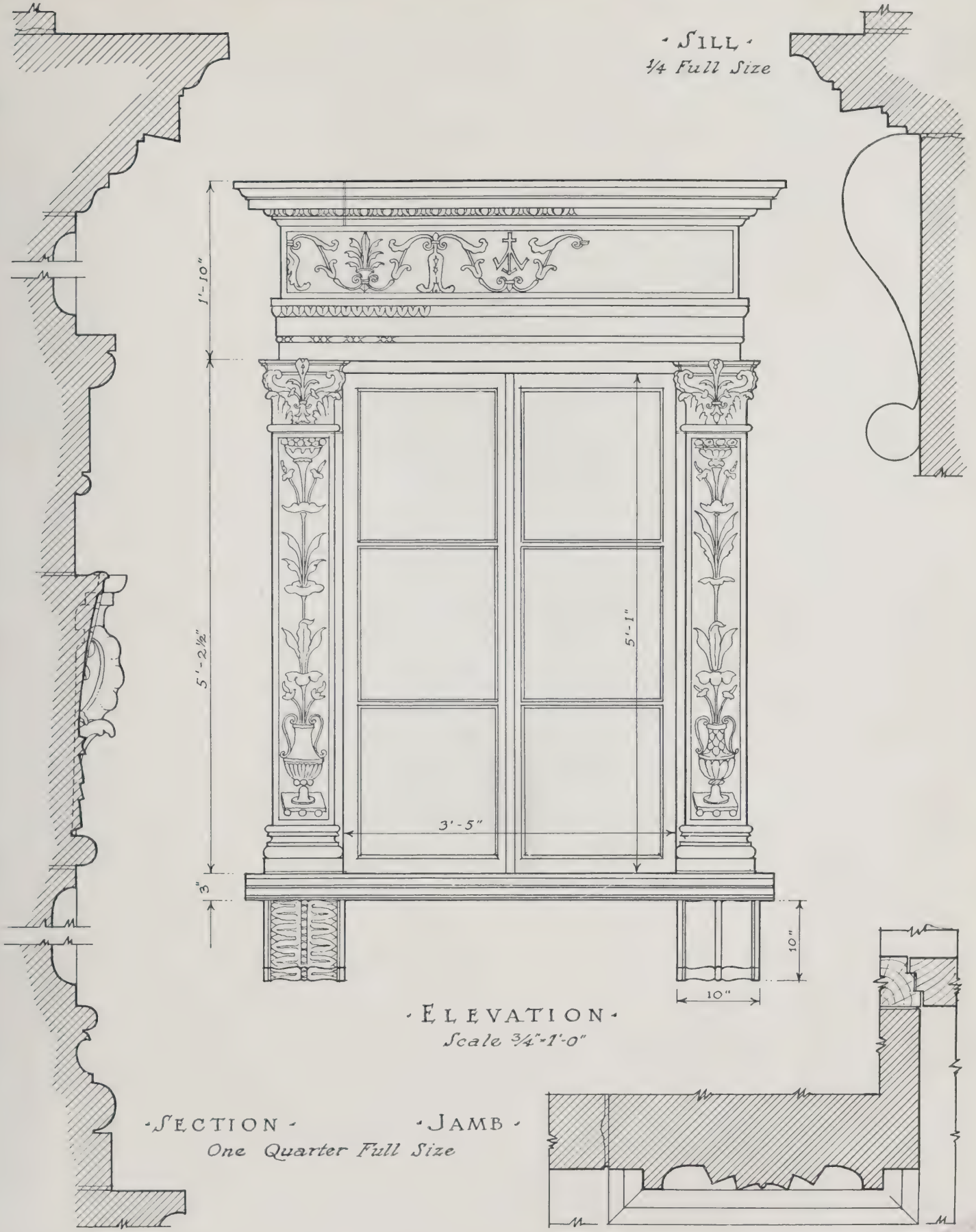


- ELEVATION -
Scale ¾"=1'-0"

ITALIAN DETAILS 1923

- MEDIEVAL FOVNTAIN - - PALAZZO *dei* PAPI & VITERBO -

MEASVRED *and* DRAWN *by* HOWARD MOÏSE



· SILL ·
¼ Full Size

· ELEVATION ·
Scale ¾"-1'-0"

· SECTION · · JAMB ·
One Quarter Full Size

ITALIAN DETAILS 1923

· RENAISSANCE · WINDOW · · TOSCANELLA ·

MEASURED and DRAWN by HOWARD MOÏSE

ITALIAN RENAISSANCE DETAILS

A SERIES OF MEASURED DRAWINGS

By HOWARD MOÏSE

RENAISSANCE WINDOW, TOSCANELLA

DESIGNS of windows and doors while important in architecture of any type are particularly so with the Italian and Spanish styles, in which the use of ornament is largely concentrated about them, the wall areas being plain to afford contrast.

This window design is typical of the treatment of windows in Italy during the renaissance period. It possesses the usual pilasters which support an entablature, the whole resting upon the sill which is supported by two gracefully modeled corbels. While slightly more ornamented than such windows frequently are, the ornament is so well distributed that there is no crowding, and the decorated parts are everywhere given sufficient contrast by plain surfaces. Like many of the details being presented upon these pages this window design is well adapted for modern use, and since its ornament is wholly in low relief and without undercutting it could be easily reproduced in terra cotta or concrete.

ENGINEERING DEPARTMENT

Charles A. Whittemore, *Associate Editor*

The Medical Arts Building, Dallas

By W. J. KNIGHT, *Consulting Engineer*

THE structural frame of the Medical Arts Building is an unusual adaptation of reinforced concrete without the presence of structural steel in any form. The building located at the corner of Pacific avenue and Masten street, embodies many features of design and arrangement that are unique in the annals of building construction. The erection of the building was planned for the distinct purpose of bringing all the elements of the medical profession under one roof, in order to eliminate the objectionable discrimination which landlords of commercial office buildings are likely to exercise against doctors and dentists. The objection to the intimate association, during the hours of business activity, of healthy persons with those who are afflicted has occasioned a widespread determination on the part of the medical profession to assemble its members in buildings that are designed and equipped to supply individual needs and to render more efficient service.

The building, 19 stories high, besides possessing the distinction of being the tallest reinforced concrete building on record, is also of unprecedented size for the exclusive housing of members of the medical profession. The first floor is occupied by a spacious drug store and an establishment supplying medical and scientific instruments. A large concrete vault is located on the first floor for the convenience of tenants who desire to store their valuables. All dental offices in the building are located so as to receive north light, while the eye, ear, nose and throat specialists have been allotted space facing the west. The X-ray rooms are enclosed by partitions lined with lead or zinc alloys to prevent "strays" from penetrating to adjoining rooms with possible injury to occupants. Each office group has a reception room and individual treatment rooms for the use of doctors who are to practice in the suite. Compressed air, gas, electricity and water have been provided in offices and lavatories in conformity with the demands of each practitioner. Lunch rooms, a modern physicians' library, and an auditorium arranged specifically for doctors and dentists also serve to emphasize the attention given to insure perfect harmony in appointments, unexcelled comfort and the most competent service. Each of the upper floors above the third consists mainly of four suites, one occupying each wing of the building, with wide halls between, and all service parts in the center.

The exterior of the building is faced with cream colored impervious brick, smooth in texture and backed with 8 x 12 x 12 hollow tile. All ornamental detail of entrances, copings, pilaster cappings, sills, etc., consists of terra cotta and cast cement. The exterior bases and base pedestals are Tennessee marble with hone finish. A mansard roof, covered with green semi-glazed Spanish tile of variegated shades, crowns the building. The first three floors occupy the entire irregular shaped lot and above the third the floors assume the shape of a cross, 111 feet, 6 inches each way to give increased light and air, with window openings along the three faces of each wing. Each wing of the cross is 39 feet, 6 inches by 36 feet, 4½ inches, with a total height of 255 feet from basement floor to the top of mansard roof. In the planning of the four wings it was desired to avoid the use of any interior columns. This condition presented the solution of a problem in long span design that would contribute materially to the lateral stiffness of the structure while acting as a unit to resist the effects of high winds, so prevalent in this section of the country, as well as to function in the normal manner when sustaining the live and dead loads of the building.

The floor construction (Fig. 1) consisting of reinforced concrete ribs or joists 5 inches wide by 22 inches deep and 3 feet, 11 inches center to center, extending in two directions, was selected for all typical floors to fulfill the manifold requirements of the design. The top slab over joists is 2½ inches thick and reinforced with two layers of triangular mesh laid in two directions. The central joists at right angles to the axis of the squares on the typical floors, are reinforced with two 1-inch round rods, one straight with hooks at each end and the other bent up near the supports, and those parallel to the axis (See Section, Fig. II) are reinforced with two 1⅛-inch round rods anchored and bent similar to rods of the joists running at right angles to the axis of the squares. The rods in all non-continuous ends of slabs and beams were hooked to furnish additional rigidity to the structure, regardless of whether theoretical calculations for bond demanded their use. The squares or rectangles formed by the two-way joists were made identical for each consecutive floor to permit of repeated use of the wood form units, thus reducing construction costs.

The first floor, which consists of flat slab con-

Medical Arts Building, Dallas

Barglebaugh & Whitson, Architects
W. J. Knight & Co., Engineers

struction of unequal spans, is designed for a live load of 150 pounds per square foot, having for its supports additional auxiliary intermediate columns extending from the basement floor and terminating at the first floor level. The typical floors are designed for these superimposed and dead loads: partitions, 20 pounds; ceiling and plaster, 10 pounds; cement finish, 9 pounds; live load, 50 pounds; dead load of floor, 82 pounds; total, 171 pounds per square foot dead and live loads. The flat portion of mansard roof is designed for a live load of 30 pounds, plus the dead load. The sloping portion of mansard roof is designed for a live or wind load of 30 pounds, in addition to the dead load of slab and tile covering. Members supporting elevators and tanks are designed according to the service requirements placed upon them.

The reinforced concrete walls enclosing the four elevator shafts are 12 inches thick from the basement to twelfth floor inclusive, and 8 inches thick above the twelfth floor level. The reinforcement for these walls consists of multiple individual stayed column units about 16 inches by 10 inches, with longitudinal $\frac{5}{8}$-inch round rods extending from the basement to sixth floor and $\frac{1}{2}$-inch round longitudinal rods above the sixth (Fig. III.). The elevator walls were designed to serve as columns for the support of their respective loads from floors above, and also as stiffeners to aid in resisting the overturning action of high winds. The reinforcement of each wall face in each story was designed so as to permit the iron workers to do all assembling on the ground, and later to hoist the units into place. The stays at each corner of elevator enclosure walls

Typical Office Floor Plan

were secured in position after the individual wall units had been hoisted and wired in place to dowels extending above each floor.

The outside corner columns in the typical stories (Fig. IV) are designed to support the greatest dead, live and wind loads of any columns in the building. In the first story these columns are 56 inches by 56 inches, with reinforcement consisting of twenty-five 1⅛-inch round longitudinals and 9/16-inch round spirals with pitch 2 inches center to center and designed for a combined load of 2,580,000 pounds, of which 180,000 is due to direct stress from wind. Fortunately, the position of these columns, located as they are in the corners of each wing, did not preclude the use of sizes dictated by consistent design.

All foundation piers of columns (Fig. V) rest on hard, solid rock. After the foundation of each pier had been excavated and leveled off, borings were made at the center to a depth of 5 feet to make certain that solid rock existed at least to this depth without the presence of air pockets. The foundation piers are tapered on four sides from the first floor level to 1 foot below basement floor; and the areas of bases proportioned so that the assumption of 18 tons per square foot was satisfied and not exceeded in any instance. The distribution of loads from basement columns into the piers is accomplished by extending the basement column reinforcement, including spirals, into the piers and terminating them at a point where the sectional area of piers not reinforced resulted in giving a maximum compression of 500 pounds per square inch.

Some difficulty was encountered in the design of exterior columns where offsets in the upper stories were necessary to harmonize with the architectural exterior. Fig. VI on the next page shows typical examples of offsets in one of these columns, which at the fifteenth story supports a total load of 499,000 pounds. This load is transferred by means of vertical shear in the fourteenth story column to the column in the story beneath. This action is made obligatory by the lateral resistance offered by the fourteenth and fifteenth floors and the convergence of spandrels at this point, which prevent any bending in the fourteenth story due to eccentric load above. The fourteenth story column is 31 inches by 60 inches, embodying two cores, each being reinforced with ¼-inch round spirals, 2 inches pitch and 27 inches diameter. One core contains ten ⅝-inch round longitudinals and the other five ¾-inch and five ⅞-inch rounds. The two cores are tied together with ½-inch round stirrups placed in pairs to form bands 12 inches center to center.

The exterior face of these columns was assumed to be subjected

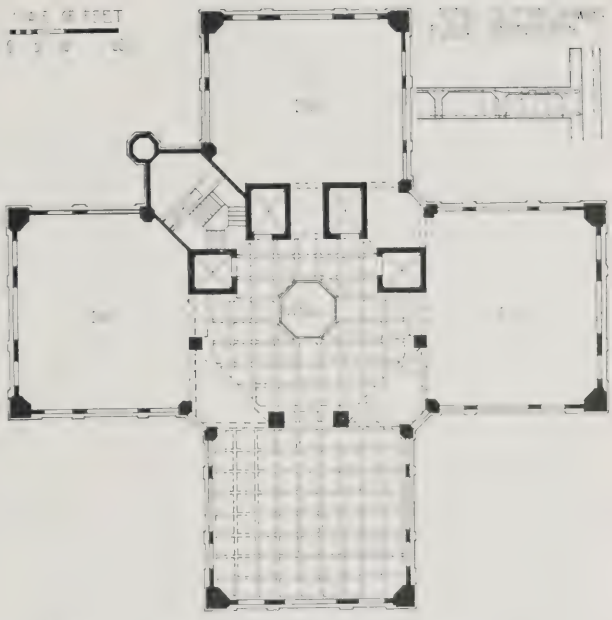


Fig. I. Typical Floor Framing. Inset, Fig. II

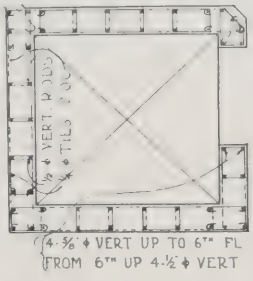


Fig. III. Detail Plan of Elevator Enclosure Above

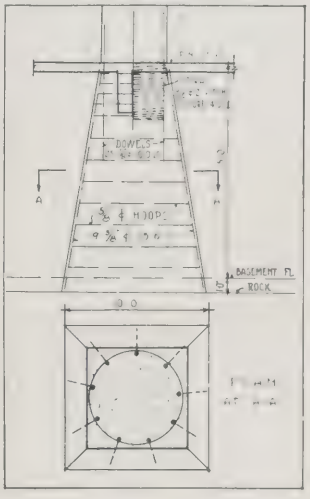


Fig. V. Detail of Column Footing at Right

Progress View of Typical Floor Showing Underside of Concrete Floor Construction

Fig. IV. Progress View Showing Relative Sizes of Corner and Intermediate Columns

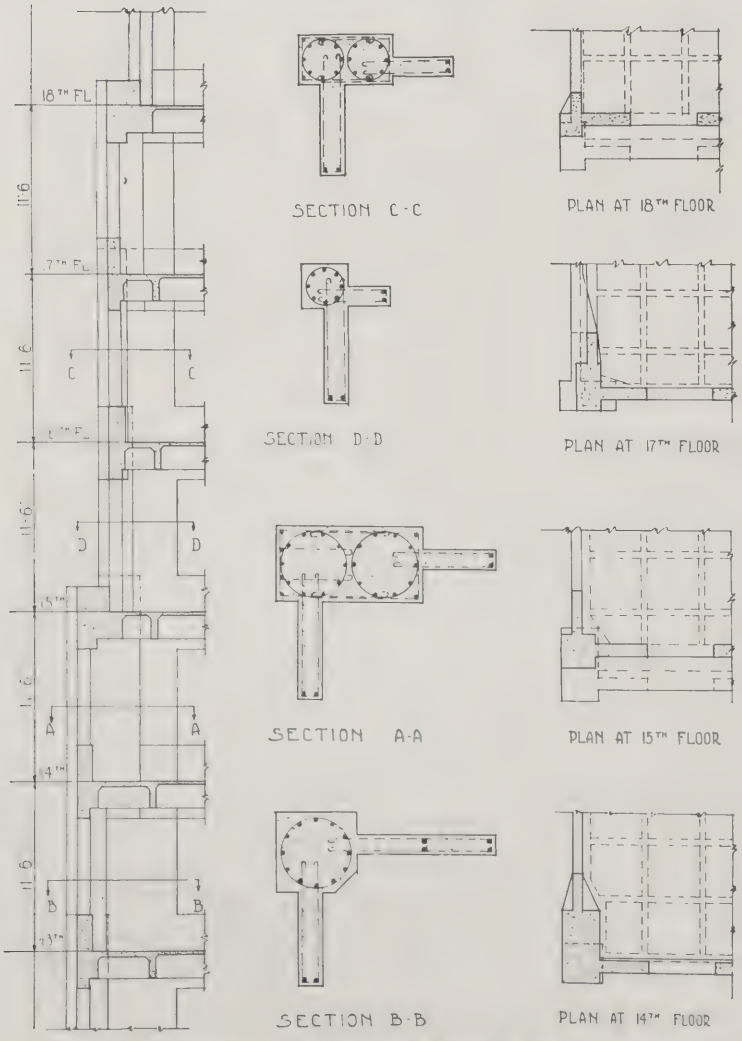


Fig. VI. Details of Offsets in a Typical Exterior Column

to tensile stress due to bending and, therefore, is reinforced with four 1-inch rounds hooked at the upper ends near horizontal face of offset. In the design of this offset a third precaution was exercised to insure absolutely a rigid section. The end of spandrel beam bearing in the column at fourteenth floor level is flared out at a point beginning 2 feet, 6⅜ inches from the face of column in fourteenth story, so that the sectional area would furnish sufficient area in shear to sustain a portion of the load from column in fourteenth story. The design of offsets required a great amount of study and theoretical, practical and common sense maneuvering before arriving at a solution that was considered applicable to such unusual conditions of design.

The spandrel beams throughout the building are unusual in size. Spandrels at the outer faces of wings are 12 by 60 inches (Fig. VII) and are designed for a maximum moment of 546,000 foot pounds or 6,552,000 inch pounds, being the combination of moments from the dead and live loads of floor, concentrated pier loads, and wind load. The maximum moment at the fifth floor produced by the wind at the column face is 330,000 foot pounds (Fig. VIII). This wind moment was assumed for all such spandrels of typical floors for the reason that as the wind moment lessens for each succeeding floor above, the column sizes also decrease in size, resulting in an increase in span length and consequently an increase of positive moment. The difference found in the combination of all moments, both negative and positive, was not sufficient to warrant any variation in the design.

Due to the narrow compression flanges of inverted spandrel beams, it was deemed necessary to use two intermediate struts 12 inches by 4 feet, 2 inches, extending continuously from the fourth floor to the attic floor. These struts together with stirrups serve as stiffeners to avoid any lateral movement of the compression flanges which have a width in proportion to clear span of 1/30.42 at the fourth floor and 1/35.6 at the attic floor.

All component parts of the structure were consistently designed for a wind pressure of 20 pounds per square foot without considering any deduction in the unit stresses in the concrete and steel resulting therefrom. An exact elastic analysis of stresses due to wind loading

of rigid frame buildings, being impossible in practice, approximate methods based on certain arbitrary assumptions are used. The four principal methods in current use, it may be said, are workable. Professor W. H. Burr in this connection is credited with the very plausible statement: "So long as the stresses found by one legitimate method of analysis are provided for, the stability of the structure is assured." This statement may be consoling to some engineers who persist in disregarding common sense applications in connection with the use of exhaustive theories.

The method known as the "cantilever method" was employed in the determination of all wind stresses in the building. It is somewhat comforting to the writer to know, in view of contradictory theories, that the wind stresses of the 36-story Equitable Building of New York were determined according to this method, and that the structure still stands.

The distance from floor to floor of all stories from the fourth to and including the eighteenth and attic is 11 feet, 6 inches. To describe more specifically the method applied, the fifth story of columns 7 and 8 (exterior corners) will be considered. The horizontal wind load of each story above and including the fifth is equal to 11.5 x 17.33 x 20= 4,000 pounds. At the attic the wind load is equal to 28.75 x 17.33 x 20=9,950 pounds.

The total moment from wind above the fifth floor about the line of inflection of the fifth story column is:

4,000 pounds x 971.75 ft.=3,887,000 foot pounds.
9,950 pounds x 155.25 ft.=1,544,738 foot pounds.
5,431,738 foot pounds

Assuming the average distance center to center between columns 7 and 8 as equal to 36 feet, we have the equation for direct stress in columns 7 and 8: (18X x 18)+(18X x 18)=5,431,738; X=8,380. The direct stress in fifth story column is: 18X=18 x 8,380, X=150,840 pounds.

The total horizontal shear in fifth story for columns 7 and 8 is the sum of the wind loads above, or 62,000 pounds. In the fourth story the total horizontal shear is 66,000 pounds. (Fig. IX). The shear taken by any column in any story is proportional to the total horizontal shear in the same story.

Referring to Fig. IX, the difference between the direct stresses in the fourth and fifth story columns, *i.e.*, (171,360—150,840)=20,520 pounds is taken up as a shear in the spandrel beam between corner columns. The moment of the shear to hold the joint in equilibrium is

Mo.=20,520 pounds x 18=369,360 foot pounds.

The bending moment for the fourth story column, having a leverage equal to the difference between the story height and the depth of spandrel beam divided by two, *i.e.*, 11 ft. 6 in—5 ft. 0 in.

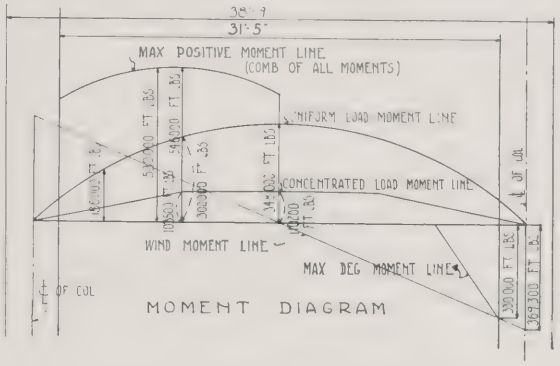


Fig. VIII. Moment Diagram of Spandrel Beam

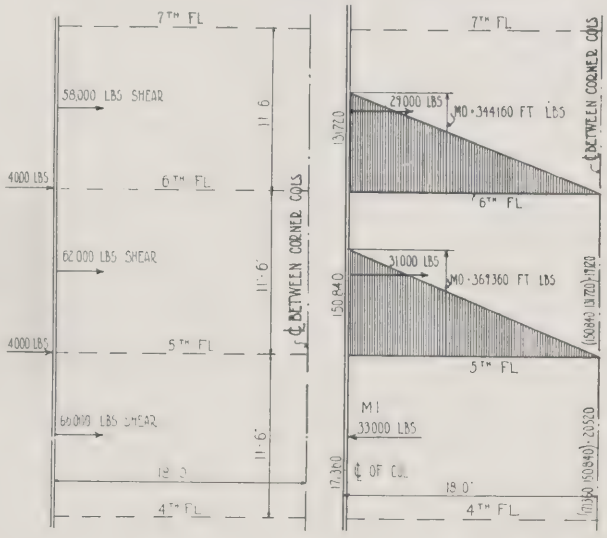


Fig. IX. Shears and Moments, Fourth and Fifth Floors

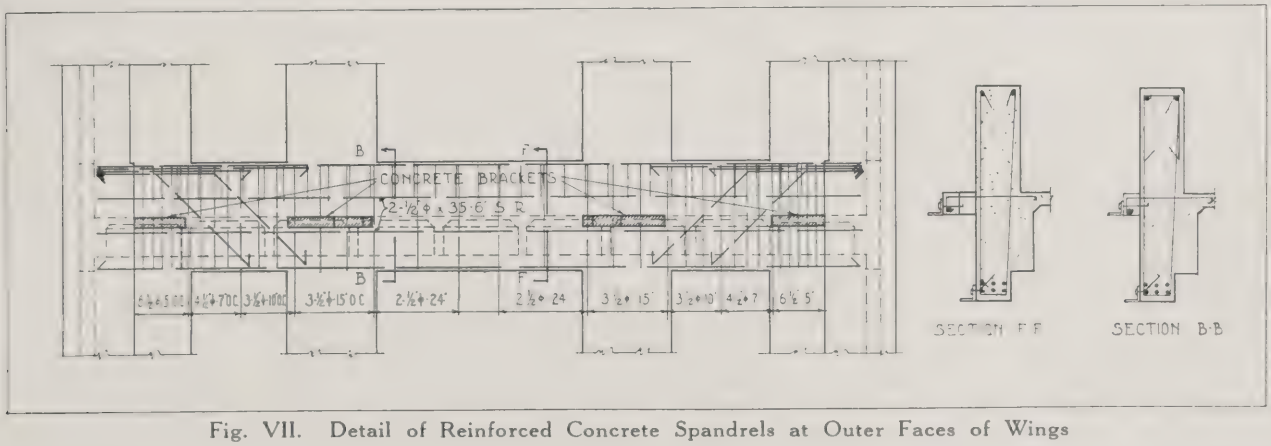


Fig. VII. Detail of Reinforced Concrete Spandrels at Outer Faces of Wings

= 6 ft. 6 in. ÷ 2 = 3 ft. 3 in.

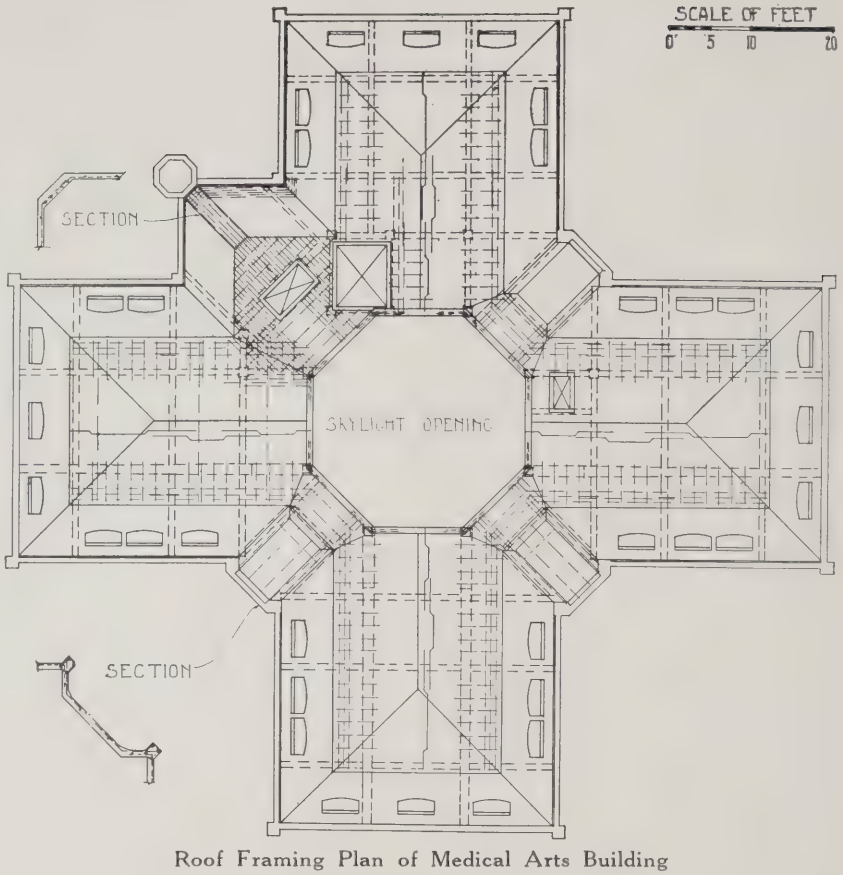
M1 = 33,000 x 3.25 feet = 107,250 foot pounds.

In like manner for spandrel at sixth floor:

Mo—19,120 pounds x 18 feet=344,160 foot pounds.

The mansard roof framing is composed principally of rigid frames and cantilever beams. From the ends of beams are suspended the loads of tank floor and two house tanks 6 feet in diameter by 18 feet long. The moment and shear diagrams indicate the forces for which the members are designed.

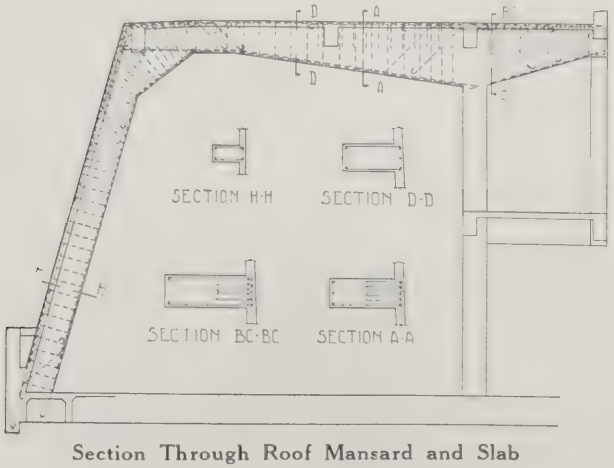
Calculations for rigid frames of the roof were based on more logical, practical, and conservative assumptions than those recommended by theories applicable to this form of construction. It will be interesting for readers to refer to the several excellent tests made at the University of Illinois, in 1918, of rigidly connected reinforced concrete frames. The assumed principle of continuity and the effective rigidity of joints as applied to the design of reinforced concrete frames, are somewhat inconsistent with the actual results determined by these tests. Discrepancies ran as high as 50 per cent.



Roof Framing Plan of Medical Arts Building

The design of rigid frames is another case where the engineer must visualize as well as theorize, and if the theories applied do not appear logical to the experienced mind, reasoning along common sense lines in conjunction with theory will inevitably give results far more consistent and intelligible.

In the design of any important structure where precedent is wanting, the engineer is frequently confronted with problems that require an application of common sense as well as technical knowledge in about equal proportions. Not infrequently the writer has computed the stresses in some member or arrangement of members by the use of formulæ too extensive to be really intelligible, and then, in the final analysis, subjected the theoretical findings to inordinate "abuse" through the injection of practical common sense, that the mind might be rendered composed and the structure stable. This understanding of the science of engineering may not be universally admitted, for in most instances it may be deemed preferable to enshroud the science with profound mystery, that others of lesser lights might acquire a deeper reverence for things apparently incomprehensible.



Section Through Roof Mansard and Slab

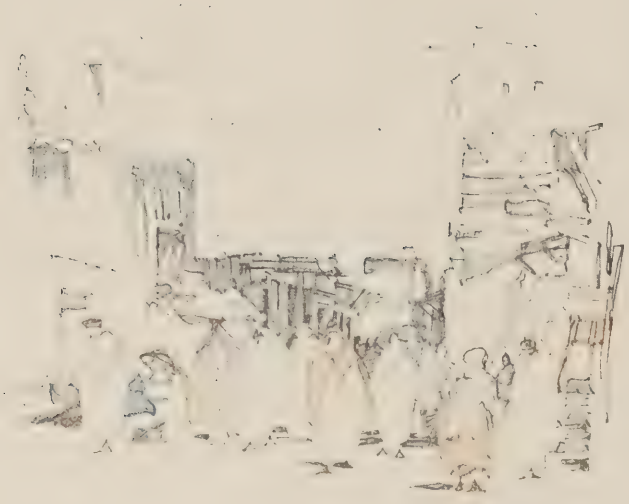
The Medical Arts Building presented very unusual wind problems. Unless one could visualize the effects of high winds acting on the vertical face of the building, any one of the several methods devised for computing approximate wind stresses would be of little service to a designer who possessed a knowledge of these theories without imagination. Even engineering requires an infinite amount of imagination, in degree proportional to that of the architect. The latter imagines and visualizes for the sake of convenience and beauty, while the former traces in his mind's eye the actions and resultant stresses in structural members under given loads. To the experienced engineer the various stresses in a member form impressions as intense and realistic as the artist's conception of his subject prior to its realization on the canvas.

A Group of Pencil Sketches in Northern Africa

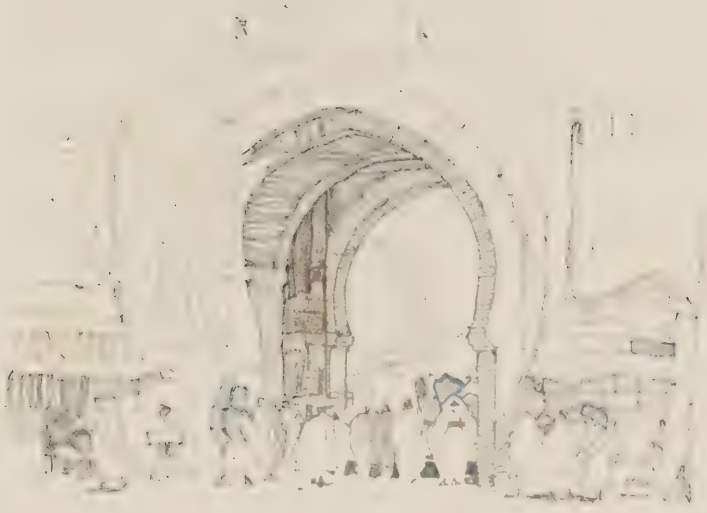
By LOUIS C. ROSENBERG

CONSTANTINE

These sketches indicate the character of the fascinating Mohammedan cities of northern Africa, with their teeming crowds contributing in their costumes color notes that contrast with the whitewashed stucco over sun-baked bricks of the walls. Brilliant color is sensed everywhere; the costumes are sometimes of pure white, others of brown or brown and white stripes; red tile in the roofs, gray blue in the deep window reveals to reduce the sun glare; an occasional warm toned marble column salvaged from Greek or Roman days, and most brilliant of all, the street markets with fruits, grains and green stuffs massed against the walls—all combine in a veritable riot of color. The illustrations herewith are the same size as the original drawings.



FROM PENCIL DRAWING BY
LOUIS C. ROSENBERG

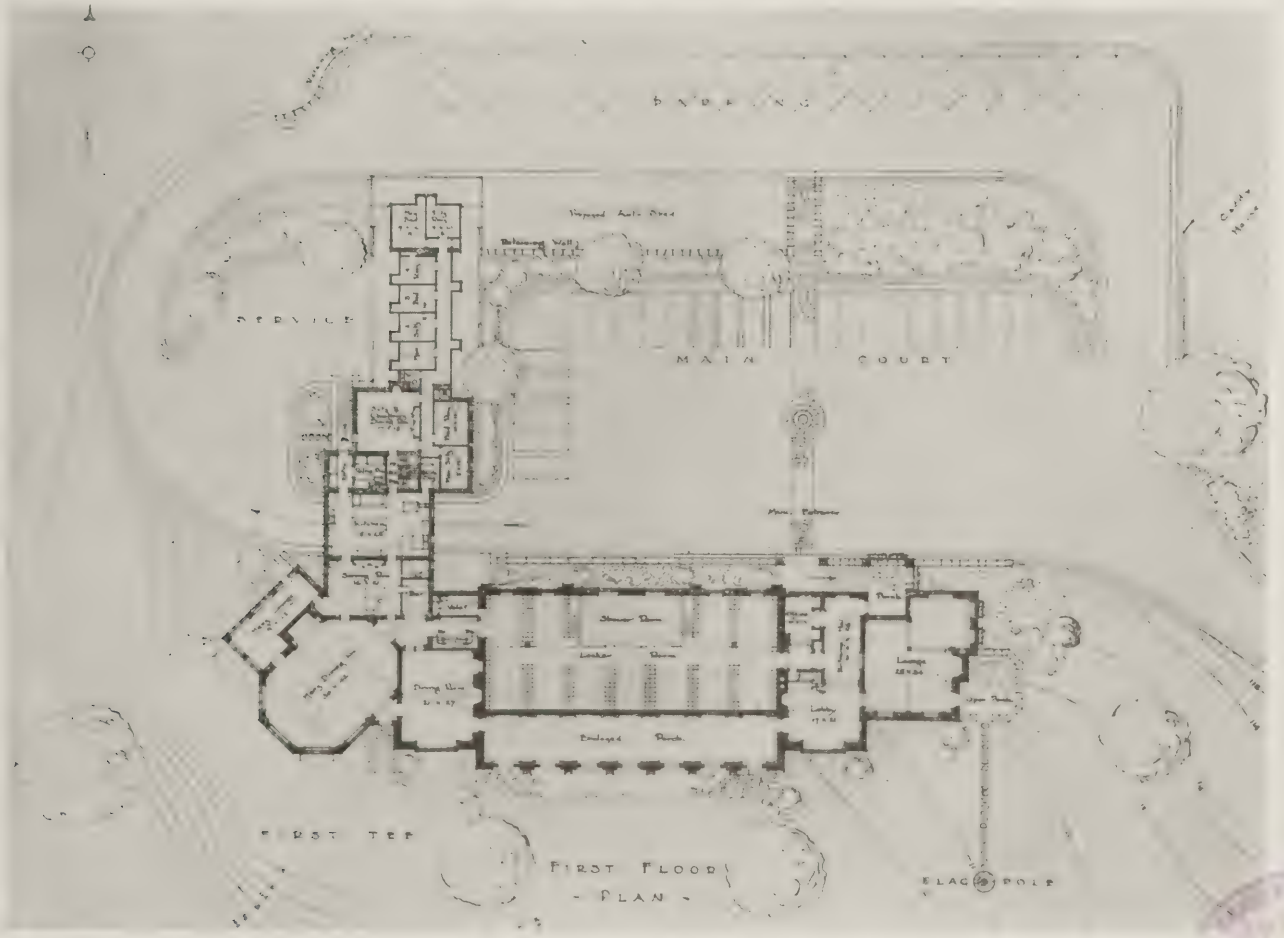


FROM PENCIL DRAWING BY
LOUIS C. ROSENBERG

FROM PENCIL DRAWING BY
LOUIS C. ROSENBERG

VIEW OF SOUTH FRONT OVERLOOKING GOLF COURSE
OAKLAND GOLF CLUB, BAYSIDE, NEW YORK
ROGER H. BULLARD, ARCHITECT

DISTANT EAST VIEW, SHOWING RELATION TO NATURAL GRADES



MAIN FLOOR PLAN

OAKLAND GOLF CLUB, BAYSIDE, NEW YORK

ROGER H. BULLARD, ARCHITECT

SERVICE WING AND UPPER PARKING LEVEL

VIEW FROM NORTH, OVERLOOKING PARKING SPACE

OAKLAND GOLF CLUB, BAYSIDE, NEW YORK

ROGER H. BULLARD, ARCHITECT

LOUNGE WING FROM THE COURSE

LOUNGE WING FROM MAIN COURT

OAKLAND GOLF CLUB, BAYSIDE, NEW YORK

ROGER H. BULLARD, ARCHITECT

GENERAL VIEW OF LOUNGE

LOBBY AND STAIRS TO WOMEN'S LOCKERS

OAKLAND GOLF CLUB, BAYSIDE, NEW YORK

ROGER H. BULLARD, ARCHITECT

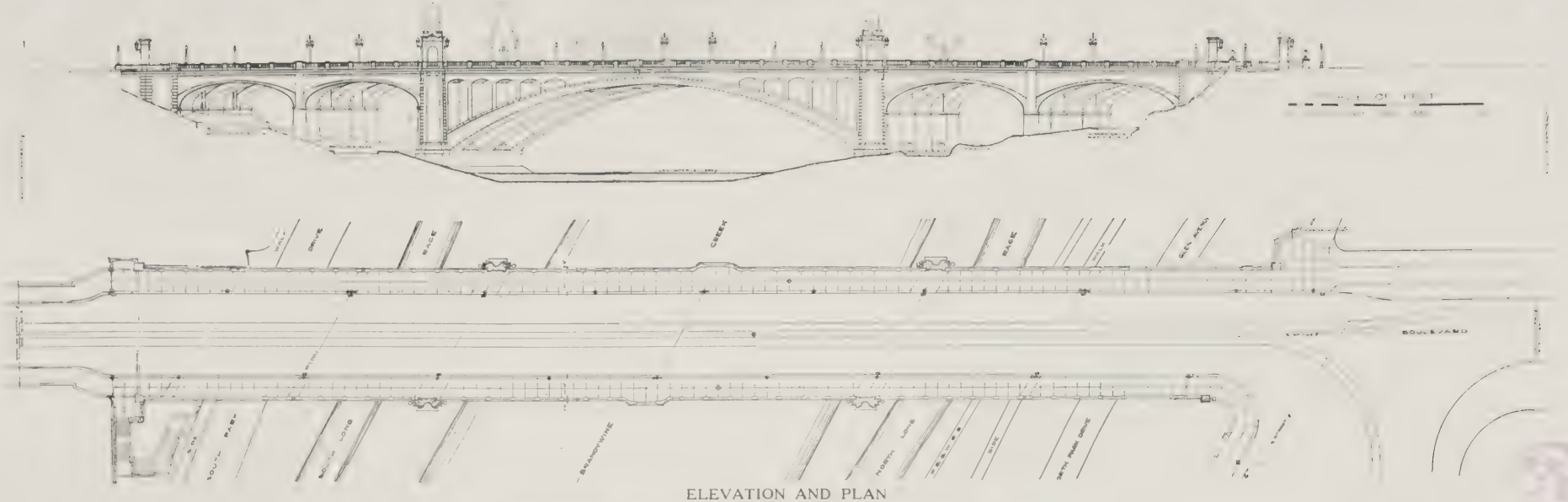
ELLIPTICAL ARCH OVER PARK DRIVE

CENTRAL ARCH SPAN

WASHINGTON MEMORIAL BRIDGE, WILMINGTON, DEL.

VANCE W. TORBERT, ARCHITECT; BENJAMIN H. DAVIS, ENGINEER

GENERAL VIEW OF RIVER SPAN



ELEVATION AND PLAN

WASHINGTON MEMORIAL BRIDGE, WILMINGTON, DEL.

VANCE W. TORBERT, ARCHITECT; BENJAMIN H. DAVIS, ENGINEER

Washington Memorial Bridge, Wilmington, Delaware

By VANCE W. TORBERT, *Architect*

ON Decoration Day, May 30, 1922, a monumental structure, officially named the Washington Memorial Bridge, spanning the historic Brandywine creek and its valley in the city of Wilmington, Del., was formally dedicated as a war memorial. This bridge, in a locality that was the theater of stirring events during the war of the revolution and that is inseparably associated with the name of General Washington, not only commemorates the patriotism of the citizens of the state of Delaware in the revolution and subsequent wars, especially the World War, but also serves to carry the important traffic of the Washington boulevard.

The natural scenic beauty of the Brandywine creek and its bordering trees and shrubbery at this point led to the designers' conception of a great central arch of masonry as being the most appropriate solution of the problem. A large pool of water just below the site, already formed by a low dam across the rocky bed of the stream, would serve as a perfect reflecting basin for a bridge structure of monumental proportions. Thus, with a long span arch as the central or primary motif, numerous preliminary sketches were made with the secondary or approach arches in proper relation to the canals and park driveways on each side of the Brandywine, resulting in the final design, consisting of a segmental arch for the central span, symmetrically balanced on either side by two elliptical arch spans.

Detail of Bronze World War Memorial Tablet

The bridge is 720 feet long and 72 feet wide, and consists of the five arch spans of reinforced concrete, two of 70 feet, one of 250 feet, and two of 85 feet. Each span consists of three arch ribs, 11 feet, 16 feet, and 11 feet wide respectively and spaced 14 feet apart. The deck of the bridge consists of a 40-foot roadway, with two trolley tracks, two 16-foot sidewalks (including balustrades) and overhangs of 3 feet on each side. The piers of the bridge are on a 30-degree skew to avoid encroaching upon the canal and railroad property, and the large 250-foot arch of 40-foot rise is one of the longest low-rise

skew-arch spans in the United States, if not in the world.

The massive piers that support the large span are triangular at the ends to harmonize with the skew arrangement, and the smaller piers are rhomboidal in section with the outer faces parallel to the bridge. All piers are of the same width as the arch ribs they support. The piers are in separate sections for each rib, the sections being independent for the short spans, but connected by curtain walls to give a more massive monolithic appearance for the channel piers. The spring lines of the large arch were placed at an elevation that would be a slight distance above the highest flood level recorded for the Brandywine at this crossing.

North Approach to Washington Memorial Bridge
Vance W. Torbert, Architect

The arch ribs for each of the 70-foot and 85-foot approach spans, of 15-foot and 18-foot rise respectively, were concreted in wooden forms supported by timber centering. For the large 250-foot arch of the channel span steel centering was used, as this was considered more adaptable for the construction and offering greater security for the support of the long span skew arches. Furthermore, one set of steel centers served successively for each of the three ribs by being lowered slightly and moved laterally into correct position, and the rock bottom of the shallow creek afforded excellent foundations for the two temporary wooden towers erected as intermediate supports for this centering. The steel truss centers were built with curved top chords to which were bolted wooden nailing strips of variable thickness to provide suitable bearing and support for the 4-inch tongue and groove lagging used to form the arch soffits.

The main arch ribs were poured in alternate blocks and keys, each completed in one continuous operation. On account of the structural jointings thus formed, the vertical faces of the arch rings were further subdivided into V-shaped joints as

Steel Centering for Arch Ribs of Central Span
Vance W. Torbert, Architect; Benjamin H. Davis, Engineer

Detail of Steps Leading to South Drive, Washington Memorial Bridge, Wilmington, Del.

voussoirs of graduated width, and terminated at the crowns by projecting keys both inside and outside. This treatment, combined with the cove moulding formed at the extrados, contributes to the architectural effect and introduces appropriate scale.

Expansion joints extending across the entire width of the bridge are located at all abutments, piers, and the third points of the large span. The floor slab at these joints was cut through free and clear and supported against bending by adjacent beams for the width of the roadway. The deck of the bridge and the backs of all retaining walls and abutments were waterproofed, and all expansion joints were flashed to prevent leakage to the underside of the structure. On the facades these expansion joints are effectively concealed from view by means of the panels in the abutment walls and the pilasters over the piers.

The three-arch rib construction permitted of a more pleasing treatment of the underside of the bridge by the elimination of the usual beam and girder construction and the use of a curved floor slab arched transversely between the ribs and continuous over the entire width of bridge. Jack arches conceal the expansion joints and serve to relieve the effect in the longitudinal direction. Over each of the arch ribs and immediately under the floor slab there is a continuous gallery, one of which is reserved for high tension electrical conduits, the second for low tension conduits, and the third for gas and water mains. A manhole cover over each gallery near the center of the bridge gives access. Each gallery is ventilated by the provision of small inlet openings between the jack arches at the piers and outlets through gratings at the bottom of the niches on the outsides of the large pylons and at the ends of the bridge in the form of 12-inch pipes carried to and up the small pylons.

Four large monumental pylons surmount the massive center piers and constitute the main architectural features above the sidewalk level and, furthermore, definitely establish the limits of the long span primary motif and emphasize the monumental character of the whole structure. On these pylons, which are 40 feet in height, the distinctly memorial features are embodied in four ornamental bronze

View Beneath Bridge Between Arch Ribs Showing Jack Arches

Construction View Showing Wood Centering and Reinforcing of Approach Arches

Detail of Monumental Pylon from Roadway, Washington Memorial Bridge

tablets, 9 feet high and 5 feet wide, placed on the inside faces in arched recesses where they can be viewed from both the sidewalks and roadway. The first two of the large tablets commemorate all of the wars of the nation, and the last two tablets commemorate the World War, one having the names of the great battles in which Delaware troops fought, and the other bearing the names of all those service men from the entire state of Delaware who made the supreme sacrifice. On the outer faces of these pylons the arched recesses are repeated in the form of niches which give balance to the design and interesting tones of light and shade in harmonious relation to the arch spans. On both the inside and outside at the cornice pediment is placed a carved shield bearing an ancient warrior's helmet in low relief, and on the obelisk portion above are large carved eagles mounted on spheres of emblematical form and representing that portion of the world where are located the principal nations which were engaged in the conflict of the World War.

Smaller pylons, of harmonious design, command the bridge portals and support bronze name plates, 3 by 4 feet, with official information and data pertaining to the bridge. On each side of the large pylons and on the approach side of the smaller pylons are ornamental bronze bracket lanterns, important features of the design composition of the bridge.

The exposed surfaces of the arch ribs, piers, abutments and spandrel walls are of plain concrete finish, carborundum rubbed. The pylons and balustrades are faced with light granite composite, about 2 inches thick, with a bush-hammered finish. The balusters and top railing of the balustrades, the eagles and spheres, shields, urns and cap stones for the small pylons were pre-cast because of the better execution of the architectural details obtainable than was considered possible with these features being cast in place.

The bridge was designed by and built under the supervision of Vance W. Torbert, architect, of New York, and Benjamin H. Davis, engineer. Alfred I. du Pont was chairman of the Washington Street Bridge Commission, and Frederick W. Carpenter was its local executive officer and consulting engineer. The construction of the bridge was financed by a county bond issue, authorized by state act, and the cost of the bridge was about $800,000.

Distant View of Washington Memorial Bridge, Wilmington, Del.
Vance W. Torbert, Architect; Benjamin H. Davis, Engineer

The Development of Charleston Architecture

PART II. CIVIC BUILDINGS

By SAMUEL LAPHAM, JR., AND ALBERT SIMONS

WHEN we turn to the bibliography of the architecture of the days of the colonies and the early republic, it is surprising to note how much greater a percentage of attention is paid to domestic than to civic architecture. Of course it is the first impulse to turn to that which is the most intimate and can be applied with the least change to the architectural requirements of clients of today, but, from the standpoint of architectural history, the records of the civic and ecclesiastical architecture of that time are ignored for those dealing with domestic architecture. It is true that the largest and most historic civic buildings, such as Faneuil Hall, Boston, and Independence Hall, Philadelphia, maintain their ground, but the minor public structures are rarely given their just due in the many monographs issued.

Nevertheless, it should be remembered that in these minor civic or semi-civic buildings there are records of immense importance; records of the tastes and inclinations of a community as a whole; records that should be studied as representative of the true group-reaction toward any architectural movement. An individual, although influenced by the prevailing fashion of the time, could and did put his own individuality into his house, if he so desired. When it came to community action, however, no person could solely impose his taste on a building, because he was no longer the only one to pass on the project. Therefore, the minor public buildings represent what the community (or at least the guiding spirits of the community) thought was appropriate in the matter of the architectural expression that a building, designed for a certain definite use, should have in order to fulfill its purpose. It is to buildings of this type that we must turn to find what a community thought was proper to represent them, their societies or their functions of government to the outside world. More than this, we learn also of the more creative side of the architects of those days—of how they solved their problems of design when faced with new conditions requiring larger vision and greater skill. We know what they accomplished in the domestic field, as it is on that work that their fame so securely rests. Here is another field in which to determine their ability and genius. And it will be by this civic architecture, in conjunction with ecclesiastical architecture, that our civilization will be judged in the future, for domestic architecture is the quickest to change and the first to fall by the action of time. Nine-tenths of our records of the architecture of past civilizations are of civic or sacred buildings. They are the most protected against change by the idea of sovereignty or sanctity that surrounds them—and so it will be with both our forefathers' and our own work, when future ages come to judge it centuries hence.

With these facts in mind, if we turn to Charleston as one of the earliest seats of colonial civilization of this country, we will find a sequence of civic buildings extending from 1767 to 1860. These survivors of fire and disasters have an architectural history which, independent of the political history that took place around and within them, has its own significance and its own important place in the ultimate development of our national architecture. In this article we can record but briefly a few buildings and state a few salient facts as seen by us, but trust that it will show how much ground still lies open for further close study of our heritage from the past.

The oldest of the purely civic buildings of Charleston is the Exchange Building or Custom House, commenced in 1767 and occupied in 1771. It is, as can be seen by the illustration, as pure an example of the English renaissance type as can be found in any of the colonies. For a pre-revolutionary building, we have the most plentiful documentary detail concerning it that one could desire. In the files of the *South Carolina Gazette* for 1767 can be found notices of the bill of appropriation for the building being read in the Commons Assembly on April 13, of the opening of bids on October 6, and of the awarding of the contract on December 1. There are also preserved the articles of agreement —which are practically detailed specifications for the building—between the commissioners for the province and the contractors, dated March 14, 1768, and the receipt of the contractors for the final payment, made January 4, 1772.

Messrs. Peter and John Horlbeck were the combined contractors and architects for the Exchange, as in those days the services of the two callings were generally combined. They appear to have been very thorough in their work, one going to England to personally select the proper materials and shipping them in a specially chartered vessel to his brother in Charleston. The whole construction seems to have been carried out with infinite care and with every endeavor to have everything of the best quality and workmanship.

While the Exchange, as it stands today, is just as it was built, it has suffered some curtailments of its original form. Although erected on the water front, the reclamation of land during a century and a half has placed it gradually nearly 500 feet inland. A narrow street on its front or eastern elevation has caused the sacrifice of a stone portico that rose almost from the water's edge, thus ruining the appearance of the main facade. This loss, combined with the growth of the warehouses around the

building, has practically reversed it and made the west front, originally designed as the secondary facade, into the chief elevation. Other losses have been the parapet, ornamented with classic urns, and the cupola that surmounted the entire composition.

The history of the cupola is of interest. Old prints of the building in 1780 show a square cupola with pilasters at each corner and a segmentary domed roof, surmounted by a Latin cross. We do not know if a storm destroyed this, but the records of the Collector of the Port in 1817 say that "the cupola has been taken down many years since." In 1833 the government made arrangements with Charles Frasier, the miniature painter, to design a new cupola, which was erected in 1835. This, in turn, was damaged so badly by the earthquake of 1886 that it had to be removed and has never been replaced. We are fortunate in being able to reproduce an old photograph of the building, found in the collection of W. M. Aiken, Supervising Architect of the Treasury from 1894 to 1897. This is taken from the northwest and shows the Frasier cupola, the parapet and the urns, all of which have disappeared today, the roof now rising directly from the cornice. With regard to the rest of the building, however, it is the same at present as is shown in the photographic illustration herewith.

Exchange Building or Custom House (1767)
Cupola by Frasier (1835)
See Measured Drawing on Page 300

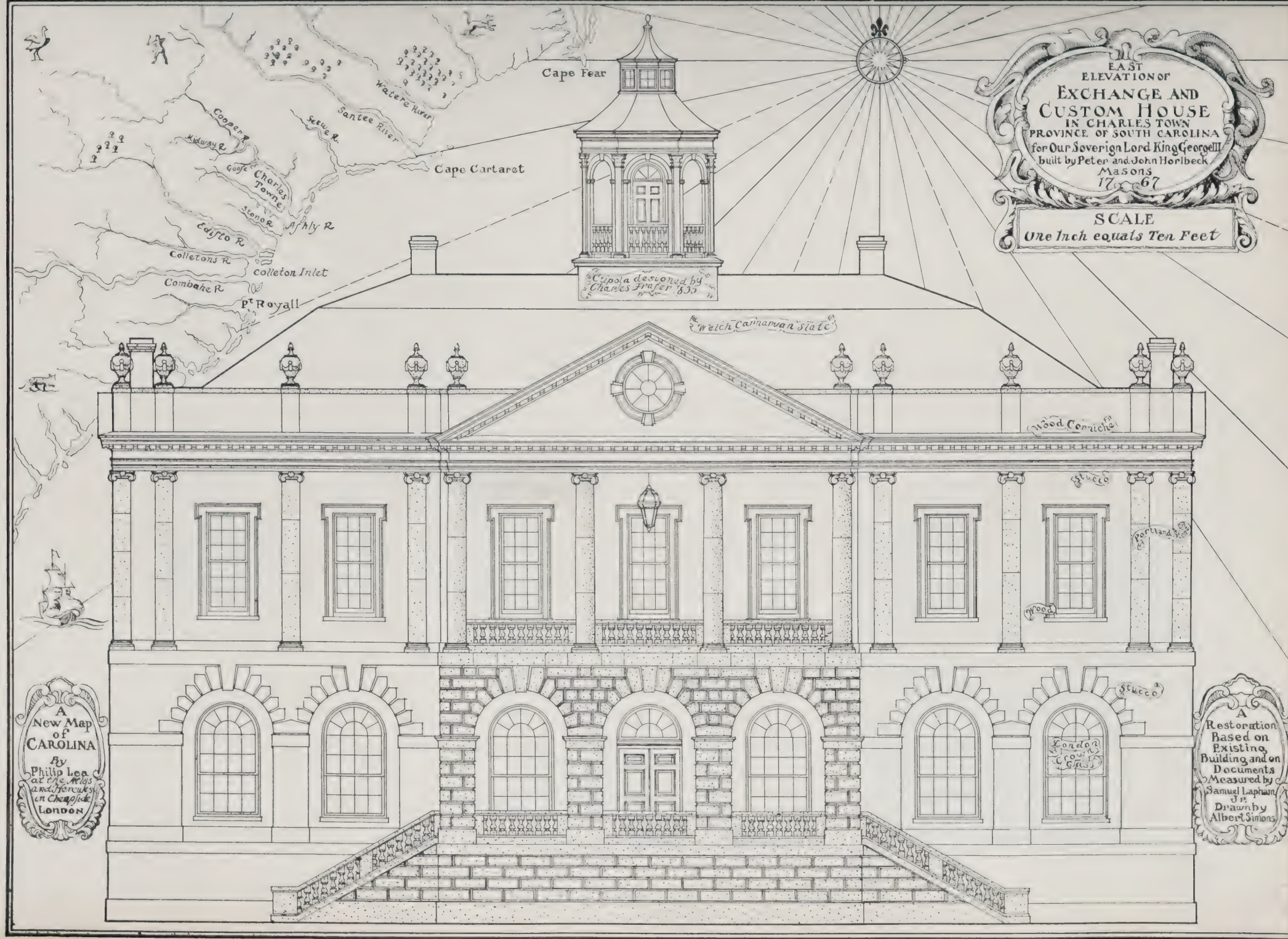
In 1913 the government conveyed the building to the Daughters of the American Revolution and the State of South Carolina as joint owners, to be preserved as a historic memorial, and as such it may be regarded as safely preserved for future generations.

Probably the first public building of any size erected in the city after the revolution was the County Court House, built on the site of the old State House, which was destroyed by fire in 1788. In Frasier's "Reminiscences of Charleston," published in 1854, and giving the author's recollections of the city as far back as 1791, are found these remarks on the court house: "The present state house was built on the foundations of the old and differed but little from it in its interior arrangement, retaining the old walls and doorways. It was originally a two-story building. I have always heard that the plan of the new building was furnished by Judge William Drayton, father of the late Col. William Drayton. But without knowing whether it was superior to the former one except by the addition of the attic, I have always thought it one of the best proportioned buildings in Charleston."

The original entrance to the building was on the wide side, which explains the reason for the projecting bay with the four engaged columns on that side. This is the earliest appearance in the city of a colossal order extending through two stories. The slender proportions of the columns and the use of the wall arcade below are characteristic of the Adam style. Outside of these features the building is, in general, an enlarged adaptation of the domestic type of the period with its quoins, belt course and pediment supported on consoles. These features appeared as early as 1762 in the Motte residence in Charleston. The applied ornamentation around the eastern doorway, with its orders, its broken pediment and inserted pedestal, is a change of unknown date. Prints exist showing both a plain entrance to match those on the south and an entrance that had an unbroken pediment carried on columns.

The City Hall was designed by Gabriel Manigault in 1801 for the United States Bank and was later purchased by the City of Charleston for its seat of government. The very attenuated proportions of the marble pilasters and engaged columns, the slight projection of the cornice of the south facade and the semi-circular bay at the rear mark a further tendency toward Adam design. This is one of the few buildings in the city where stonework was used on the main facade in place of the generally adopted imitation of stucco on brickwork. Gabriel Manigault, the architect for the building, is one of the first local architects that we know by name. He appears to have devoted himself to the designing of buildings rather than to their construction, thus being more the professional architect of today than the architect-builder of the colonies. He had a flourishing practice at this time, as several large residences and also the hall of the South Carolina Society, to which we will shortly refer, were designed by him.

The plans of these last two buildings are of little value as giving information in regard to the relationships originally existing between their component parts. Both the city hall and the court house,


EAST ELEVATION OF
EXCHANGE AND CUSTOM HOUSE
IN CHARLES TOWN
PROVINCE OF SOUTH CAROLINA
for Our Soverign Lord King George III
built by Peter and John Horlbeck Masons
17 67
SCALE
One Inch equals Ten Feet
Cape Fear
Waccamaw River
Santee River
Cape Cartaret
Cooper R.
Kidway R.
Goose Creek
Charles Towne
Stono R.
Ashly R.
Edisto R.
Colletons R.
Combahe R.
Colleton Inlet
Pt Royall
Cupola designed by Charles Fraser 1835
Welch Carnarvan slate
Wood Cornice
Stucco
Portland Stone
Wood
Stucco
London Crown Glass
A New Map of CAROLINA By Philip Lea at the Atlas and Globe in Cheapside LONDON
A Restoration Based on Existing Building and on Documents Measured by Samuel Lapham Jr. Drawn by Albert Simons

Charleston County Records Building (1822)
Robert Mills, Architect

while in general unchanged externally since erection, have been so remodeled and rearranged internally to meet different uses and requirements that they retain only the most primary divisions of the original schemes and give but little indication of their character.

The oldest of the semi-public buildings existing today in Charleston is the home of the South Carolina Society, built in 1804. The society was founded in 1737 as a charitable organization, but soon became a social club as well, in which membership was eagerly sought. It was therefore able to build a hall for its own use, capable of taking care of its large meetings and banquets. Gabriel Manigault, mentioned in connection with the city hall, was also the architect for the South Carolina hall and successfully interpreted the character that would be desired by such a society. The entrance portico extends over the sidewalk—those being the good old days when city street lines were by no means sacred—thus sheltering the stairs leading to the high main floor. This gives a very happy effect, the stairs being monumental enough to serve their public function, yet retaining their private character through the shelter of the projecting portico. The stuccoed Doric columns of the entrance, although rather attenuated as their height has to include the high base as well as the first floor, aid the monumental air and blend with the severe lines of the body of the building. The wooden Ionic columns and cornice of the wide second story piazza counteract the extreme severity and bring the whole composition back from cold public formality into the intimate atmosphere of personal relationship and social intercourse. The detail of the interior is especially charming. The mantel-pieces, door and window frames display the scheme of Adam decoration at its very best.

By the beginning of the third decade of the nineteenth century the classic revival in its Roman phase, with the Greek phase closely following it, had spread throughout the country. In the County Record Building (1822), by Robert Mills, we find a treatment of proportions that resembles a modified Greek Doric type. As Mills was an engineer as well as an architect, all his structures have a certain feeling of having been reduced to the fundamentals with the inclusion of as few secondary members and decorative motives as possible. The Baltimore Washington Memorial, the Bunker Hill Monument, and the Washington Monument, all from his hand, are essentially structural designs only, and even his work in later life smacks of the same character. In the building under consideration, Mills outdid the Greek Doric and the Tuscan orders in simplicity. His mouldings are reduced to the fewest possible, and those have profiles of the most elemental character. This building will well repay study. The utter bareness and simplicity of each part are amazing, but it is equally amazing to find that, to the casual glance, the building displays no appearance of bareness, but instead, a most satisfying appearance of completeness coupled with proportion. It may be said to be one of the first, if not the first, fireproof structures in the country. As the depository for the county records, it was Mills' aim to

Charleston County Court House
Erected Between 1788 and 1800

make it fireproof, and from the time of its erection to the present day it has never been referred to locally save by the name of "the fireproof building," thus showing the deep impression that was created at the time of its construction. It certainly was as fireproof as it could be made with the materials at the disposal of the architect in those days. Not only the exterior walls but the inner partition walls were of brick for their full heights. The floors, therefore, could be carried on vaults of brickwork, thus obviating joist construction entirely. All openings have stone lintels or are made with circular heads in order to have a brick arch to carry the superimposed load; the floors are paved with stone slabs, carried by the brick vaults, and an interior flight of stone steps leads from the basement to the second story within a well of brickwork. A monograph could easily be devoted to this building, both in regard to its structural and its æsthetic design.

The College of Charleston can trace its history as far back as 1770, and as the college has occupied the same site for 150 years it is no surprise to find on its campus work that dates from every period of our architectural history. The main block of the college is a composite building, formed by the needs of a century and a half. The foundations, almost 3 feet thick, are the sole remains of two revolutionary barracks buildings that were utilized for college purposes in 1790. By 1825 these were in need of enlargement and repair, and we find the citizens subscribing to a fund for the erection of a central building. In the minutes of the board of trustees, for July 26, 1826 is the notation that the building committee be authorized to contract for a central building as soon as $10,000 were on hand, "agreeable to a plan to be obtained from a regular architect."

South Carolina Hall, Charleston (1804)
Gabriel Manigault, Architect

In August of the same year, the secretary is instructed "to apply to Mr. Strickland of Philadelphia for a plan for a college building." In November, 1827, the contract for construction was given to Mr. Wm. Bell; the cornerstone being laid with Masonic ceremony on January 12, 1828. In the Charleston Library is preserved a pamphlet containing the address made on this occasion and a cut of the building, showing that the present portico was not included in Strickland's original scheme. Mr. Bell's final and total bill of construction, including extras, is recorded in the minutes of May 31, 1830 as amounting to $13,222.40.

In 1846 more room was needed, and we also find a committee recommending the addition of a portico on the south front. At that time Col. E. B. White was in Charleston as superintendent of construction for the new Custom House. He seems to have been able to combine a private practice with his official occupation and his army duties as he is known to have been the architect for the office of Judge Pettigru in St. Michael's alley and also, on May 4, 1850, we find him appointed by the trustees as architect for the new college buildings. These consisted of outer wings to the main building of 1828, presumably the portico to it and the combination entrance gateway and janitor's lodge. This gateway is a product of the high noon of classicism and could serve in any textbook of the orders as a copy plate for the Tuscan

Charleston City Hall (Originally the United States Bank), Erected 1801
Gabriel Manigault, Architect

College of Charleston, Charleston, S. C.

Central portion erected in 1828; extreme right and left wings and portico erected in 1850

order. It was built certainly prior to 1852, as the minutes of October 18 of that year contain regulations governing the janitor occupying the lodge. Both wings erected by Col. White fell in the earthquake of 1886, but were restored on the same lines, the east in 1888 and the west in 1895.

The small College Library on the west of the campus was built in 1855. In the minutes we find ourselves in a most modern atmosphere of architectural practice, which seems quite out of place with the date. Three architects submit plans, the board selects one, then reverses itself and elects one of the rejected competitors. The bids run high; the committee wishes to build for $8,000; one contractor cuts his bid to $9,000 and is given the job. He, in turn, goes bankrupt and the whole matter is taken to the courts for settlement. We also come across our first record of an architect's pay as we find Mr. G. C. Walker's bill for architectural services in the minutes, the same being 5 per cent on the total $9,000.

The collection of pamphlets that gives us the cut of Strickland's building for the College of Charleston also furnishes one of the Medical College building, erected in 1827. The cut gives the name of F. Wesner as architect, and he certainly deserves credit for a most tasteful little structure. Today, with its portico destroyed and the building itself but a shell, we prefer to give a reproduction of this old cut rather than one of a decaying structure that will soon disappear.

In the Hibernian Hall, (1840), we have the first semi-public building of the pure Greek type to appear in the city. Among the churches however, Mills' First Baptist Church (1822) shows Greek proportions, although Roman in detail, and the synagogue of 1840 is Greek Doric. The first move of the Hibernians towards having a hall was made in 1828, but the society immediately divided itself into two camps—those wishing a hotel and those desiring a hall. The two parties fought tooth and nail for ten years, and it was not until 1838 that the hotel faction yielded and the building committee was definitely authorized to build a hall. What the poor architects suffered during this decade can best be realized by those who know the profession from the inside. We find "T. W. Walker, architect, of Philadelphia" submitting plans for a combination hotel and hall in

Entrance Gateway, College of Charleston, Charleston, S. C.

Erected before 1852

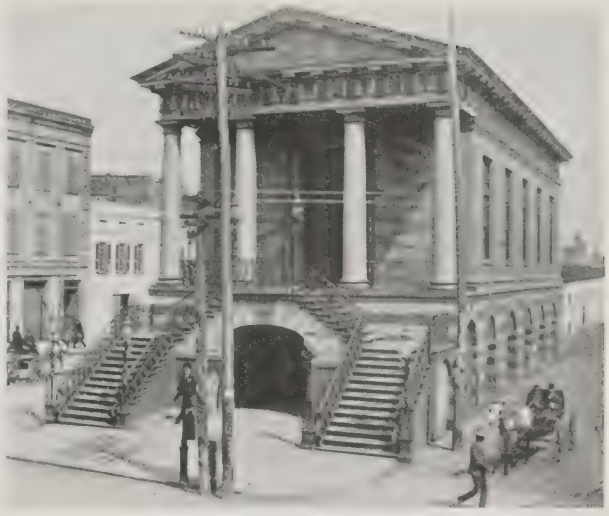
Engraving of Medical College of South Carolina, Charleston, S. C.

Erected 1827. F. Wesner, Architect

1833; in 1834 he submitted two other plans, and there were various plans from other architects; in 1835 the committee reports that they had advertised for plans in New York, Baltimore, Washington, Boston and Philadelphia, had received estimates and awarded premiums, but there is no mention of a selected architect. The cornerstone names no architect, although the stonecutter, the carpenter and the bricklayer are recorded there. The committee doubtless thought any mention of the architect unnecessary in view of their own knowledge, which they thus recorded in their report:

> "The materials of architecture may be compared to words in phraseology having separately no power but which, linked together by ignorance may excite ridicule or disgust, or may be so arranged by skill as to affect the mind with the most thrilling sensations or sublime conceptions.
>
> "Of this latter character we acknowledge the remains of those beautiful and venerable reliques which once adorned the temples of Attica and Italy; from one of which, the beautiful Ionic Temple, consecrated to the Muses, on the banks of the Ilisus, is your hall selected. In this selection your committee will not permit itself to doubt that they were but responding to the best feelings of the members of this Society and that a unanimous approval awaits their decision."

The "sublime conception" in this case consists of a colonnade of Greek Ionic columns, surmounted by a pediment. Internally, the building consists of a large hall on each floor with the necessary dressing rooms, committee rooms, etc. The entrance leads into a large stair hall, in the center of which an open rotunda extends to the roof. This is carried by the three Greek orders, very correctly superimposed, and crowned with a coffered dome. Fortunately for the peace of mind of the classicists



Market Hall, Charleston, S. C. (1841)

on the committee, the second story is of such height as to allow the Ionic and the Corinthian orders to be superimposed without difficulty, although the circular balcony that the Corinthian columns rest on, cannot be reached in any way save through a trap door in the ceiling of one of the dressing rooms. As an interesting comparison with the prices of today, we find that the committee reported that the hall would cost $78,000 in stone and $48,000 in brick covered with cement, the building being 60 feet by 125 feet. As with almost all other work in the city, the brick type was chosen, but the actual final cost, according to the records, was close to $55,000.

With the classic revival in favor for both civic and ecclesiastical buildings, we find that the Roman type had as many adherents as the Greek, and the field was equally divided between the two from 1840 to 1860. In 1841, the year of the dedication of the Hibernian Hall, we find in the Market Hall, above the market where the produce of the country was brought for sale, a pure Roman Doric temple on a high podium. This building is as good a copy plate for the Doric order as the lodge of the College of Charleston is for the Tuscan order. The metopes are filled with bulls' heads, rams' horns and wreaths, and even the neckings of the columns have the characteristic little rosette ornaments. Conforming to the other buildings, the Market Hall is of brick covered with stucco, but, on account of the completeness of its detail, it exhibits strikingly the skillful handling of the stucco and the careful modeling, simulating details originally designed for building with stonework.

Hibernian Hall, Charleston, S. C. (1840)
The First Semi-Public Building of Pure Greek Type

Bennett's Rice Mill, Charleston, S. C. (1844)

In Bennett's rice mill (1844) we see to what lengths the desire for classicism was carried, as here, in a purely industrial building, we have engaged orders, Palladian windows and details from the palaces of the Italian renaissance. Nevertheless, the unknown architect combined them to give a most striking composition and imparted to the building a most unusual air of distinction and individuality.

The Custom House (1850), by Col. E. B. White, whom we mentioned in connection with the College of Charleston, is the last of the public buildings in the period before the Civil War. Although patently of the type that, inspired by the national capitol, has produced so many state capitols and public buildings, it is beautifully executed and has detail and feeling enough to lift it out of the commonplace. Although originally planned to be crowned by a high dome and to have a portico at each cardinal point of the compass, through the intervention of war, only the east and west porticoes were built. Constructed of stone throughout, its Roman Corinthian porticoes dominate the water front as in some landscape after the manner of Claude-Lorrain and make it an architectural landmark worthy of the government that it represents.

In a sketch like this we have been able to examine only some of the chief civic and semi-civic buildings of the city, with hasty remarks to show the trend of influence and ideas that affected their material form and make them significant today as architectural documents of a period formative and historical.

Like each of the older cities on the Atlantic seaboard Charleston has its own architectural traditions and its own methods of using classical motifs and antique forms. From this glance into the past, it will be clearly evident that architecture in Charleston has been distinguished by dignity, by refinement and by a scholarly appreciation for correctness of form. In our present day quest for progress and modernity, which is altogether to be commended, let us not ignore the value of this great heritage, which is far more valuable than mere pedantry and more vital than mere sentiment; it is nothing less than the records of the ideals of a people.

United States Custom House, Charleston, S. C. (1850)
Col. E. B. White, Architect

Analyzing the Last Three Years of Building Activity

By C. STANLEY TAYLOR

IN this article there is presented for the first time a detailed graphic analysis of the building boom of the last three years. Nineteen charts are used to illustrate data which should prove extremely interesting to architects for the purpose of measuring the relative activities in different offices.

This information will also be found of direct value in discussing with clients conditions affecting new building projects. The activity which has taken place in each of the seven important building types is clearly pictured for the past three years.

The sequel to this article will appear next month as a forecast of building activity for 1924, based on reports received from nearly 2,000 architects and classified geographically and by building types. The combined information afforded by these two articles will give an exact analysis of the building situation as it affects the individual building problem of the average client, and will help him to determine the feasibility of immediately undertaking the proposed project.—*The Editor.*

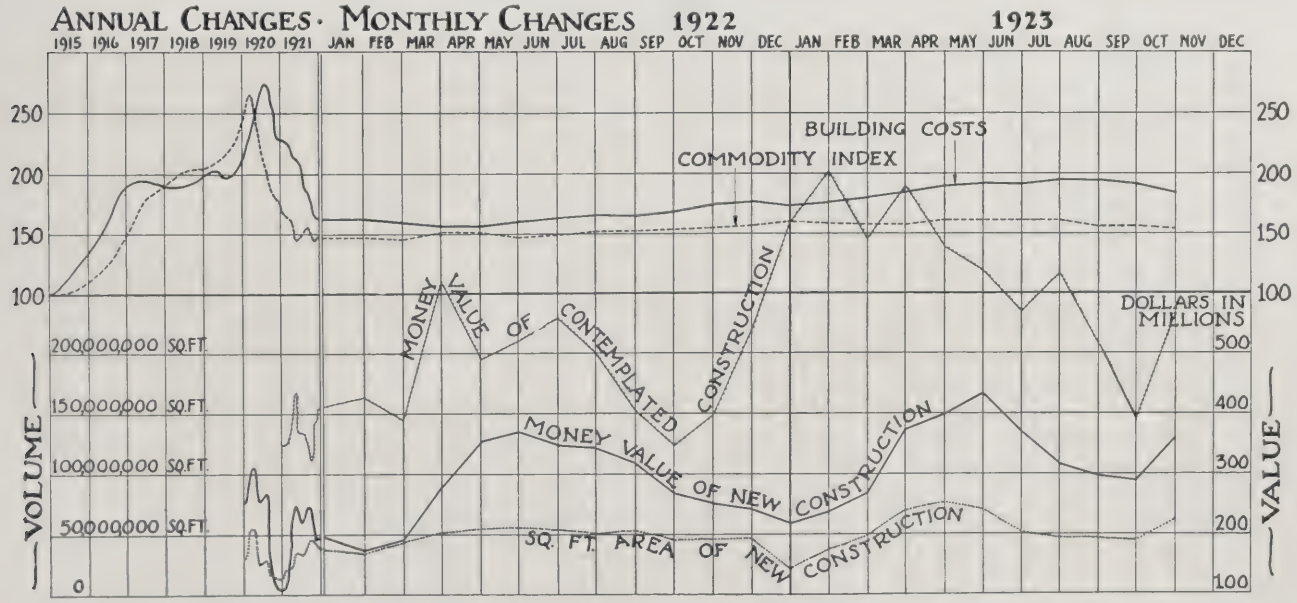
THE purpose of this article is to show clearly the part played by each of seven important building types in the unusual building activity of the years 1921, 1922 and 1923. It is also proposed to indicate the important basic factors which influenced and controlled building conditions during those years, so that the present building situation, as affecting anticipated activity for 1924, may be established against a clear background of facts.

In architectural circles, and generally throughout the construction industry, it is recognized that the last three years constitute the greatest period of building activity ever known in this country. Few individuals have either time or sufficient statistical data to thoroughly analyze new construction figures for this period, and as a result references must be somewhat vague in character and of little constructive value in discussions between the architect and his clients or when the architect is attempting to analyze his own business in relation to the unusual activity of the years in question.

In order to present this analysis in the clearest and quickest way we have selected the medium of graphic charts, 14 of which will be found in the color section immediately following this article. The 14 charts in question present an analysis of these seven building types, first as to the amount of money invested in new construction in each type, and, second, as to the physically measured volume of new construction in each. The types considered are:

1. *Residential Buildings,* including dwellings, apartments and hotels.
2. *Commercial Buildings,* including office buildings, banks, public garages, stores, and storage and warehouse buildings.
3. *Industrial Buildings,* including factories and power plants.
4. *School Buildings,* including structures of all types for schools, colleges and universities.
5. *Hospital and Institutional Buildings,* including sanatoriums and homes.
6. *Club and Recreational Buildings,* including fraternal buildings and auditoriums, theaters and welfare buildings.
7. *Church and Memorial Buildings,* including convents, monasteries, chapels and parish houses, covering all religious activities.

The graphic charts are arranged to indicate total monthly averages throughout the three-year period, and by the use of colored lines it has been possible



Monthly trend of building costs; contemplated construction; and the value and volume of new building. Note interesting resumption of activity in October, 1923. (This chart appears each month in the Service Section of The Architectural Forum, recording new data in order that architects may know the exact building situation

to superimpose the years so that a quick comparison can be made for each month. The first series of charts indicates the amount of money invested each month in the various types of new building construction. At the left of the charts will be found a scale, given in millions of dollars so that each monthly figure may be easily read across. Similarly, in the second series of seven charts the information as to new construction is given in physical volume as measured by the number of square feet involved. At the left of these charts will be found a scale established in millions of square feet for the first four charts and in 100,000-square foot units for the last three charts, the scale having been raised for clearer indication in these building types which involve a volume too small to be shown properly on the 1,000,000-foot scale. With the exception just noted, these charts are subject to immediate graphic comparison, so that the relative activity in each building type is shown instantly.

Before taking up a detailed consideration of the 14 charts already described, it will be of interest to examine carefully the chart shown on the first page of this article which indicates the trend of several important factors in the building field during the three years. This is the chart which appears regularly each month in THE ARCHITECTURAL FORUM on the first page of the Service Section (yellow pages in the last section of the book). This chart shows the monthly variation of building costs as indicated by the line in the upper section. It also shows the variation of general commodity costs. In the lower section of the chart will be found

(a) the monthly averages of contemplated construction (which is the report of plans filed throughout the country);

(b) the money value of new construction (the total of contracts let);

(c) the volume of new construction (the square foot area represented by contracts let).

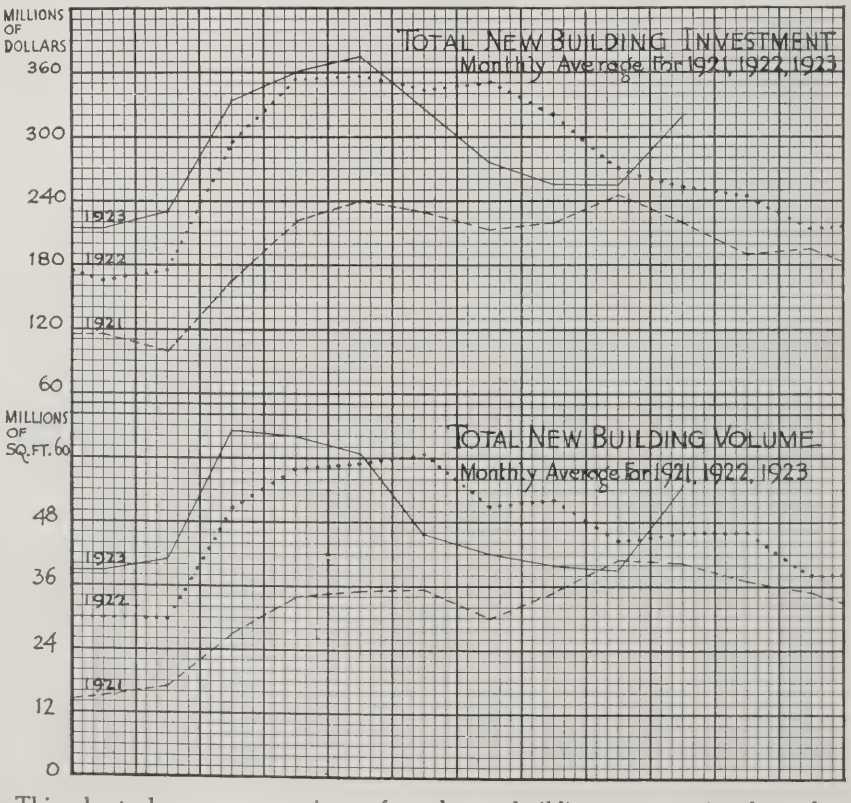
In order that an exact comparison may be made of the total new building investment and volume, there will be found on the second page of this article a chart with the yearly lines superimposed which represents the totals of the 14 individual type charts following.

This analysis has been started with January, 1921 because (as an examination of the chart on the first page will show) that period represented approximately the middle point in the rapid drop in costs which had started in 1920 and continued to the end of 1921.

We have for comparison the year 1921, when costs were dropping rapidly and confidence of the investing public was being shown by the development of unusual building activity; the year 1922, when costs carried on at the new level and then turned upward again as a result of continued building activity; and finally the year 1923, when in spite of rising costs the greatest activity of any year has been witnessed, including the phenomenon of a winter building boom as indicated by the sharp upturn of the lines in October.

This unusual increase in activity as shown in the month of October is represented primarily by an unusual volume of new apartment and dwelling construction undertaken for winter building in the New York and New Jersey districts. This question of building in the winter is discussed in an interesting manner in an article in THE FORUM Digest, which will be found in another section, and it is interesting to realize that the scientific consideration of the possibilities of winter building seems to indicate that costs are no greater and that an even distribution of building activity throughout the year is entirely logical. Building contractors and investors in New York are certainly demonstrating their belief in this theory by undertaking a vast volume of building.

Another reason for this sudden building activity



This chart shows a comparison of total new building construction by value and volume for the interesting years of 1921, 1922 and first 10 months of 1923. Trend lines are superimposed so that monthly comparisons may be made instantly

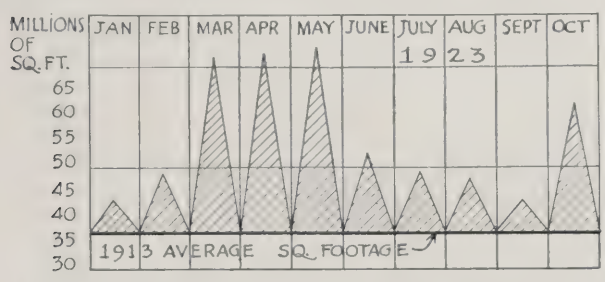
in New York is that large realty investors and speculators were waiting to see what conditions would develop in the fall rental market, particularly in high class apartment buildings. Practically all of these buildings filled up with tenants, many on two- and three-year leases and without any material reduction in rentals. As the result of this condition, many large contemplated projects were immediately undertaken for building during the winter to be ready for 1924 spring and summer occupancy.

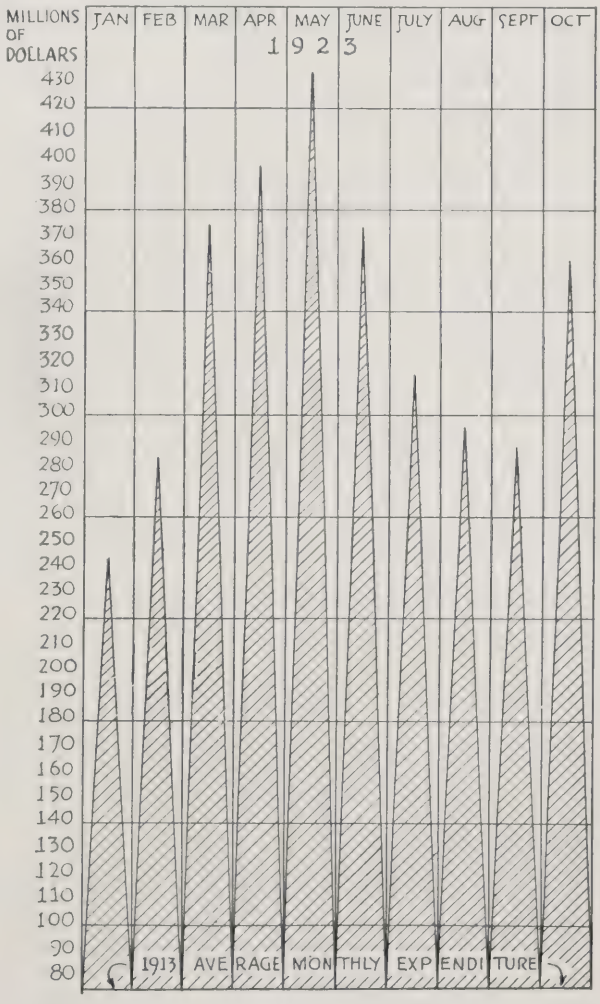
The confidence of loaning institutions continues unshaken, as indicated by the ease with which large building projects for 1924 are being financed. This confidence is based on a feeling of certainty that there will be no sharp decrease in the cost of building which might endanger collateral by establishing low replacement values. It is also evident that the investing public has great confidence in first mortgage bonds, because after a natural slowing down of mortgage bond investment during the summer of 1923, the fall showed a great increase in the amount of money flowing into the building field.

Another interesting consideration is indicated by the line (in the chart on the first page) showing the money value of contemplated construction as represented by the plans filed throughout the country. The month of October witnessed unusual activity in the filing of plans, which increased again in November. It will be noted in looking over past months and years on this chart, that whenever the value of contemplated construction shows high peaks, this is soon followed by a considerable increase in the number of contracts actually let. These factors would seem to indicate that there will be another phenomenal boom, this time probably starting earlier than in past years, because contracts must be let early in order to take advantage of the building material market.

At the present time the stocks of building material manufacturers and dealers are low, and the market is being drained by this unusual winter activity. Because of this situation there are serious dangers that the spring of 1924 will see again established chaotic conditions of unfilled orders and slow deliveries, with a probable rise in material prices. There are certain offsetting conditions which will probably relieve the situation as compared with the last two years. Production facilities of manufacturers have been increased to a certain extent and the railroad shipping conditions are much better. To a certain degree manufacturers are anticipating the heavy demands of the spring, and it may also be realized that the active program of winter building will serve to distribute the volume of activity.

On the second page of this article will be found a chart which provides a graphic comparison of total building activity for the past three years. This is shown both in actual money invested and in the volume of new buildings. The charts in the special color section following this article indicate a division of this activity. Thus, if an architect is discussing with a client the new hotel, office building or industrial building, it will be possible to trace the activity in each of these fields by referring to the charts covering the particular building type in question. These charts are presented on cross-section paper so that they may be easily read and also in order that additional lines may be plotted if the architect wishes to undertake an analysis of his own. The reading of these individual charts will show seasonal activity in the different building types and monthly comparison for the various years, all of which will help to determine the feas-



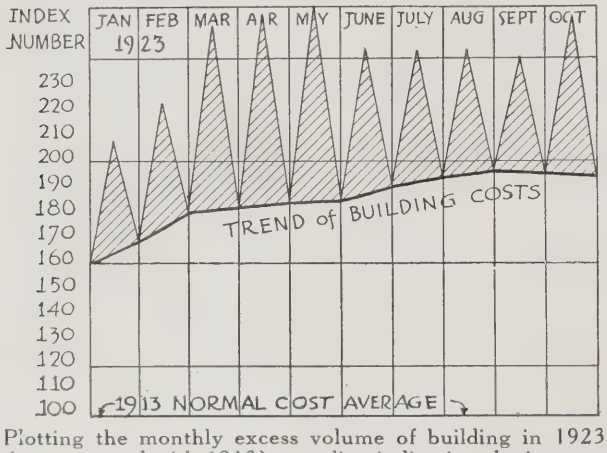


These charts show the monthly volume (left) and value (right) of new construction in 1923 in excess of the monthly average of the year 1913. This is a graphic comparison in which the difference in the size of triangles for each month represents the increased cost of building since 10 years ago

ibility of undertaking operations immediately, or at what season of the year such undertakings may seem logical.

Following is a brief consideration of some of the interesting points indicated in these individual charts:

Residential Building Investment. (Chart No. 6.) A glance at the various charts in this section indicates immediately the importance of residential construction which has constituted almost 40% of the building during these years. Residential construction as shown here includes not only dwellings, but apartment buildings and hotels, dwellings representing about one-half of the total. Beginning in January, 1921, it will be seen that the amount of money invested in residential construction has mounted from a monthly average of $31,000,000 in June, 1921, to the peaked month of March, 1923, in which con-



Plotting the monthly excess volume of building in 1923 (as compared with 1913) on a line indicating the increasing cost of building during 1923, we have a true picture indicating a comparison such as the months of January and September above—in these months the excess volume (represented by triangles) was almost equal, but increased costs show a much larger money expenditure

tracts let for new construction in this type amounted to over $165,000,000. The active periods for letting contracts were twice a year, the largest movement being in the spring and the secondary movement in the late winter. October, 1923, however, shows a much larger volume of contract letting as explained in previous paragraphs. This indicates a tendency toward a logical procedure of winter building and should encourage architects' clients to give serious consideration to this possibility. The chart shows a greater volume of residential building each year beginning in 1921, but that in the month of June, 1922, there was greater activity than in the same month in 1923.

Residential Building Volume. (Chart No. 13.) A comparison of the volume of residential building with the value as discussed above shows that the trend lines in both charts follow courses which are quite similar, which would seem to indicate that the activity in this field has been of a general nature, with no periods concentrated on particularly cheap or particularly expensive types of buildings. Otherwise there would be an average in the general trends of volume and money invested.

Commercial Building Investment. (Chart No. 7.) The lines on this chart indicate that the large volume of planning for office buildings and similar types is carried out through the winter and contracts are let somewhat later in the year than the residential building. The peak of activity is in the spring, and each year shows another active movement early in the fall, as it is evidently feasible to get large structures of this type under way in the early fall in order that they may be partially enclosed for the purpose of winter building.

Commercial Building Volume. (Chart No. 14.) The comparison of these charts shows more clearly a fluctuation due to the construction of expensive types of buildings. It will be noted that the line indicating the amount of money being spent in this class in 1922 passed above the line for 1923 in February. Comparing these lines in the volume chart it will be seen that this line did not pass above that of 1923 until April. This indicates that in 1922 the average type of commercial building was of a higher class and more expensive than during 1923.

Industrial Building Investment. (Chart No. 8.) This chart indicates that the amount of money spent for industrial building was considerably more in 1923 than in 1921. In 1922 an interesting period of activity is indicated in August and September, and again in May and June of 1923 there was considerable activity. September and October of 1923 show another increase in the letting of contracts for industrial buildings.

Industrial Building Volume. (Chart No. 15.) This chart indicates that the actual volume of industrial building gradually develops toward the middle of the year, subsiding again in the winter. The 1923 line shows slightly less volume in October than September, although the same line in the investment chart described above shows only a slight drop from August to September, although the investment chart shows a sharp increase in the amount of money spent which would indicate here that more expensive types of buildings have contributed to this increase.

In the same manner comparisons may be made in the other building fields indicated. Thus in hospitals and institutions (Charts Nos. 10 and 18) it will be seen that activity has been quite similar during the three years with various changes occurring in alternate months throughout 1921 and 1922, and a steadier line for 1923, which is almost an average of the activity of the two previous years.

Just as indicated in charts Nos. 12 and 19, the heavier periods of contract placement extend from May to August in every year. This would indicate a logical reason for letting contracts for church work earlier in the season when there is less competition in this particular class of highly specialized contracts and equipment.

Graphic Analysis of 3 Years of Building Activity

A Comparison by Volume and Investment of the Relative Activity During the Years 1921, 1922 and 1923 in Each of Seven Important Building Types, Representing 95% of the Total Construction Activity of the United States

THESE charts are completely explained in the accompanying article preceding this page. The purpose of the charts is to provide a complete comparative analysis of seven types of building activity during the years 1921, 1922 and 1923. In each chart the years are superimposed for the purpose of making rapid comparisons with building activity in any month. In order to facilitate the comparison of individual business with general trends in the building field, these charts have been carefully presented on cross-section paper, so that additional trend lines may be drawn using the units given for establishing a new vertical measure to fit the individual problem. Comparisons are given first, in the amount of money invested in seven types of new buildings, and, second, in the actual volume of new building construction in these seven types measured in total number of square feet involved in the letting of these new contracts.

The Money Which Has Been Invested in New Buildings

(A Series of Seven Charts Showing Comparisons for Three Years)

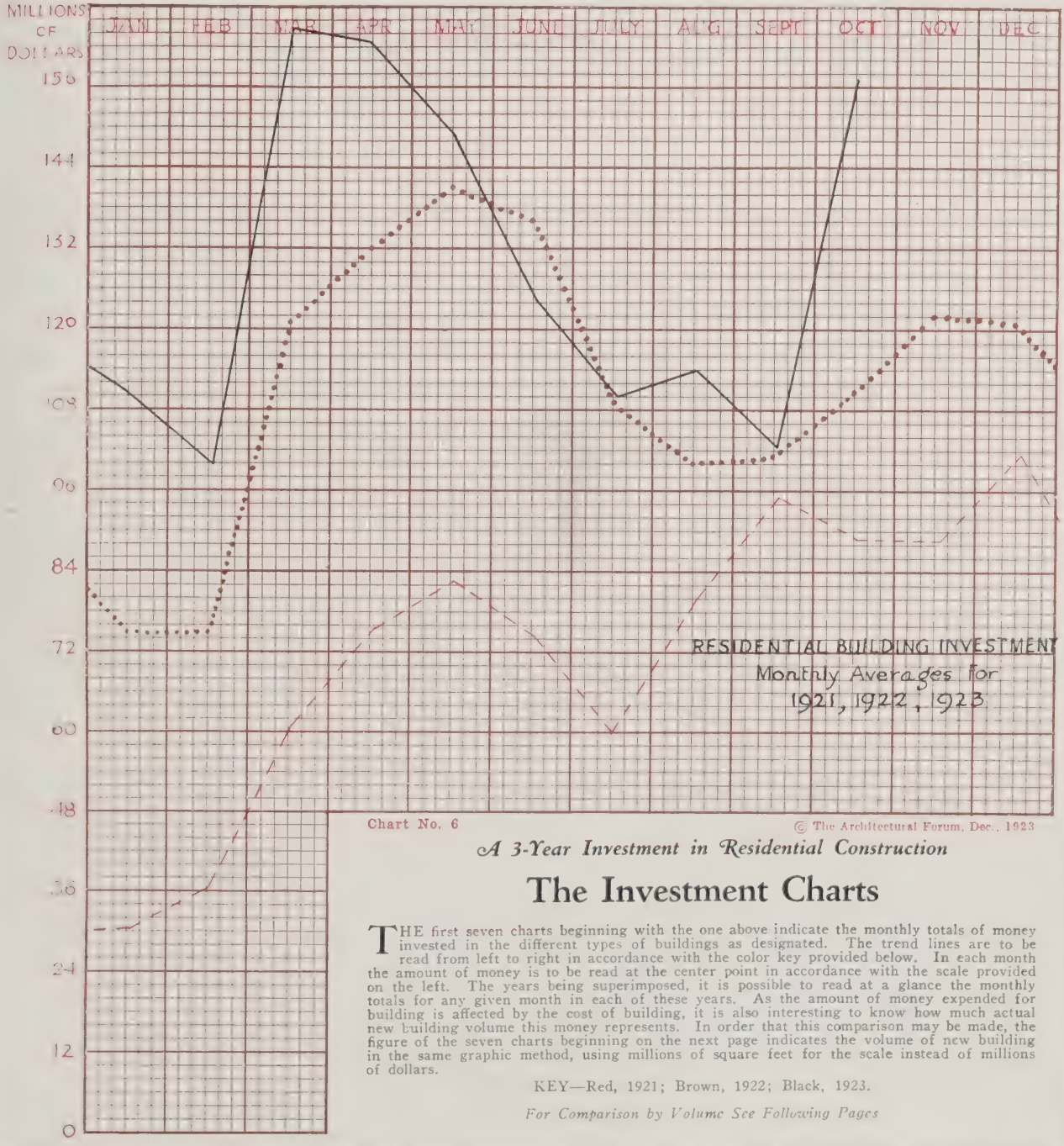


Chart No. 6

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A 3-Year Investment in Residential Construction

The Investment Charts

THE first seven charts beginning with the one above indicate the monthly totals of money invested in the different types of buildings as designated. The trend lines are to be read from left to right in accordance with the color key provided below. In each month the amount of money is to be read at the center point in accordance with the scale provided on the left. The years being superimposed, it is possible to read at a glance the monthly totals for any given month in each of these years. As the amount of money expended for building is affected by the cost of building, it is also interesting to know how much actual new building volume this money represents. In order that this comparison may be made, the figure of the seven charts beginning on the next page indicates the volume of new building in the same graphic method, using millions of square feet for the scale instead of millions of dollars.

KEY—Red, 1921; Brown, 1922; Black, 1923.

For Comparison by Volume See Following Pages

These Charts May Be Reproduced by Any Publication If Proper Credit Is Given to THE ARCHITECTURAL FORUM

Graphic Analysis of 3 Years of Building Activity

(See Preceding Text for Full Explanation)

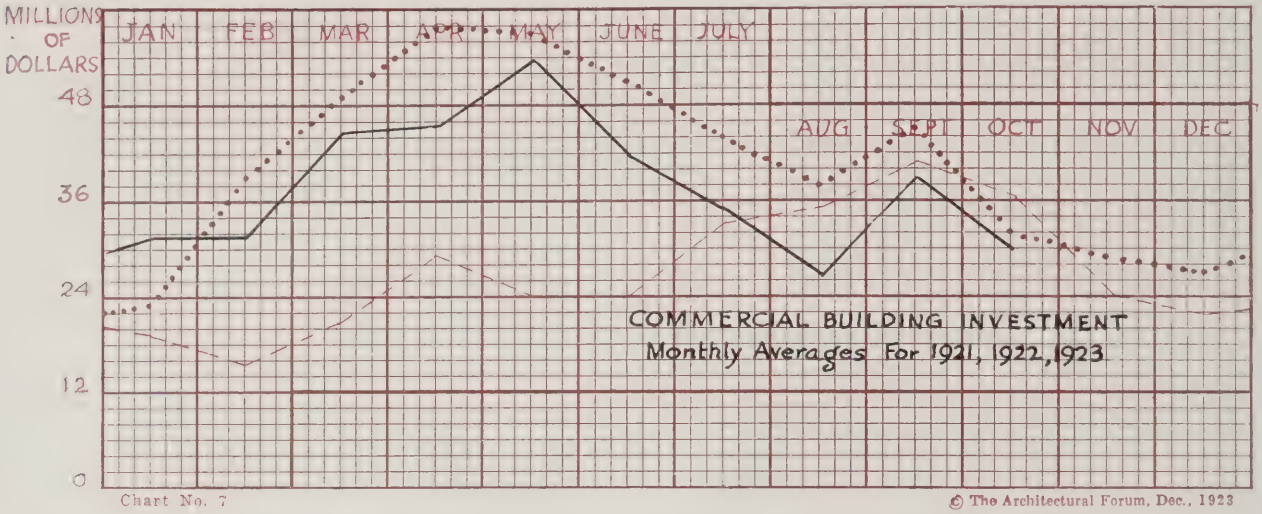

Chart No. 7

© The Architectural Forum, Dec., 1923

KEY—1921, Red Broken Line; 1922, Brown Dotted Line; 1923, Black Solid Line.

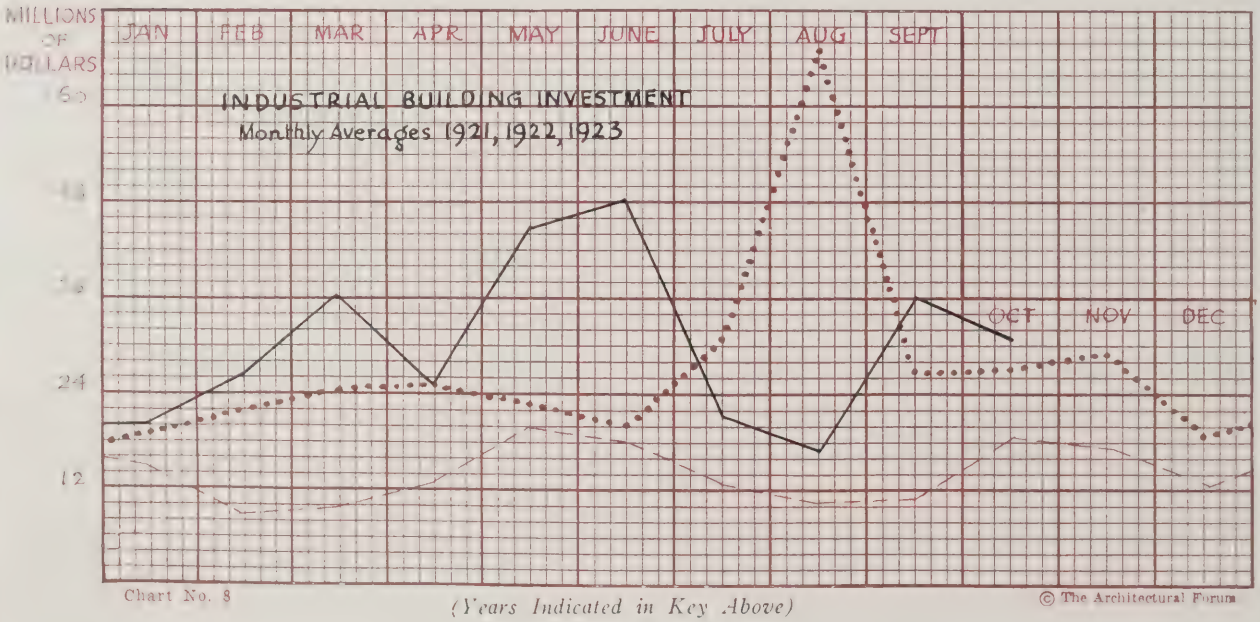

Chart No. 8

(Years Indicated in Key Above)

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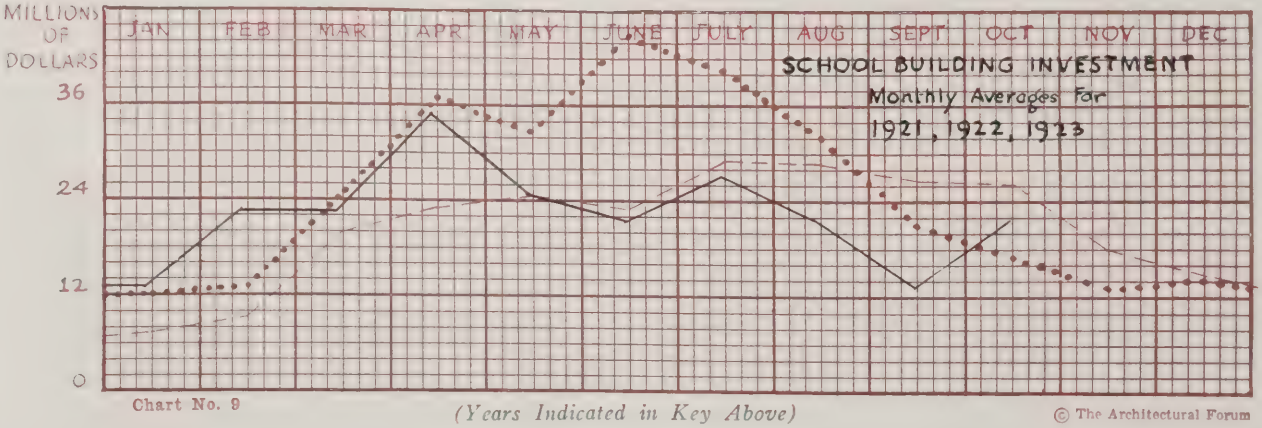

Chart No. 9

(Years Indicated in Key Above)

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Graphic Analysis of 3 Years of Building Activity

(See Preceding Text for Full Explanation)

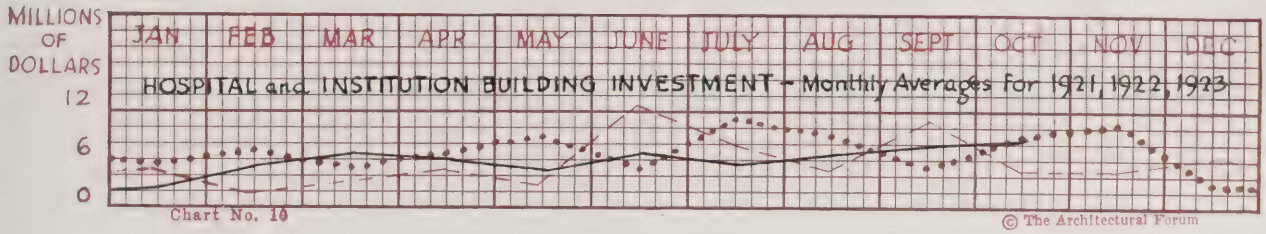

Chart No. 10 © The Architectural Forum

KEY—1921, Red Broken Line; 1922, Brown Dotted Line; 1923, Black Solid Line.

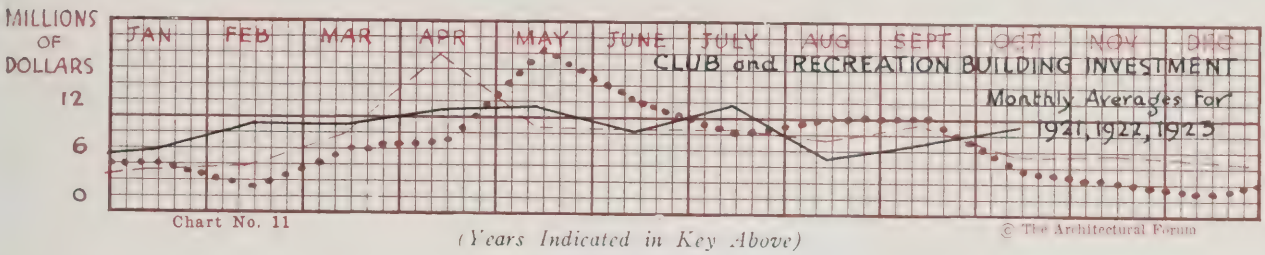

Chart No. 11 © The Architectural Forum

(Years Indicated in Key Above)

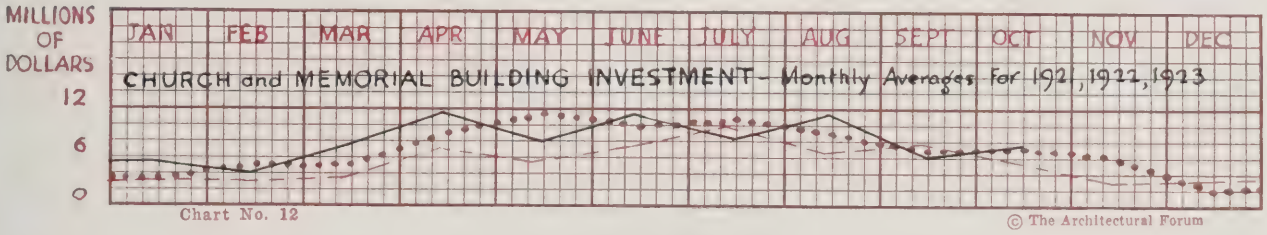

Chart No. 12 © The Architectural Forum

The True Picture—Structural Volume of New Buildings

(A Series of Seven Charts Showing Comparisons for the Three-Year Period)

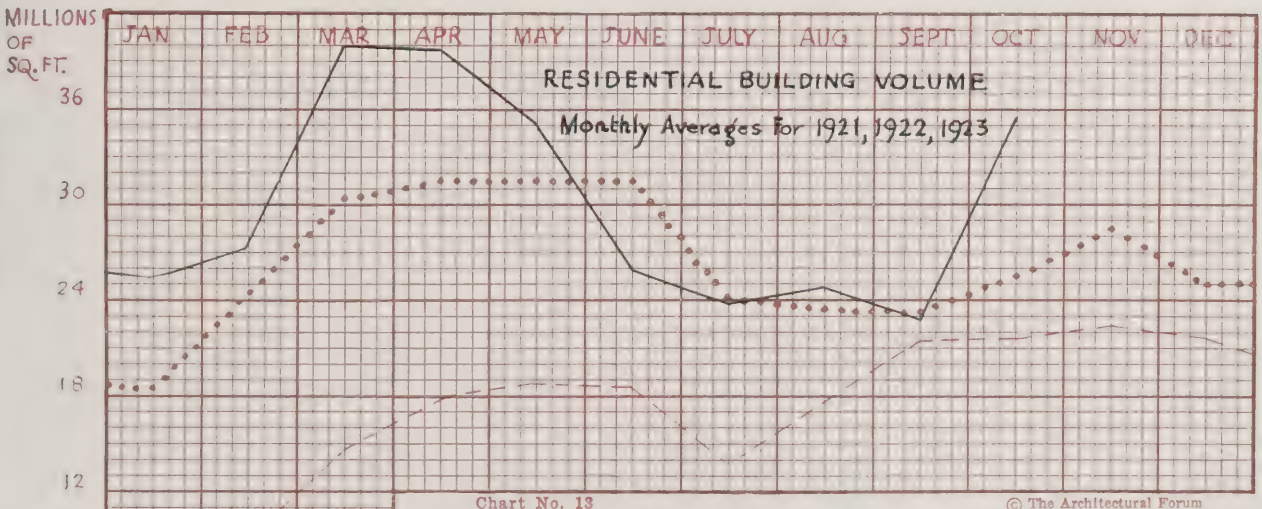

Chart No. 13 © The Architectural Forum

THE VOLUME CHARTS

THESE charts indicate the true physical picture of building activity, as the points in each month are measured on a basis of the number of square feet involved in new contracts in these seven building types. In the preceding charts the measure is given in dollars invested in new buildings.

KEY—Red, 1921; Brown, 1922; Black, 1923.

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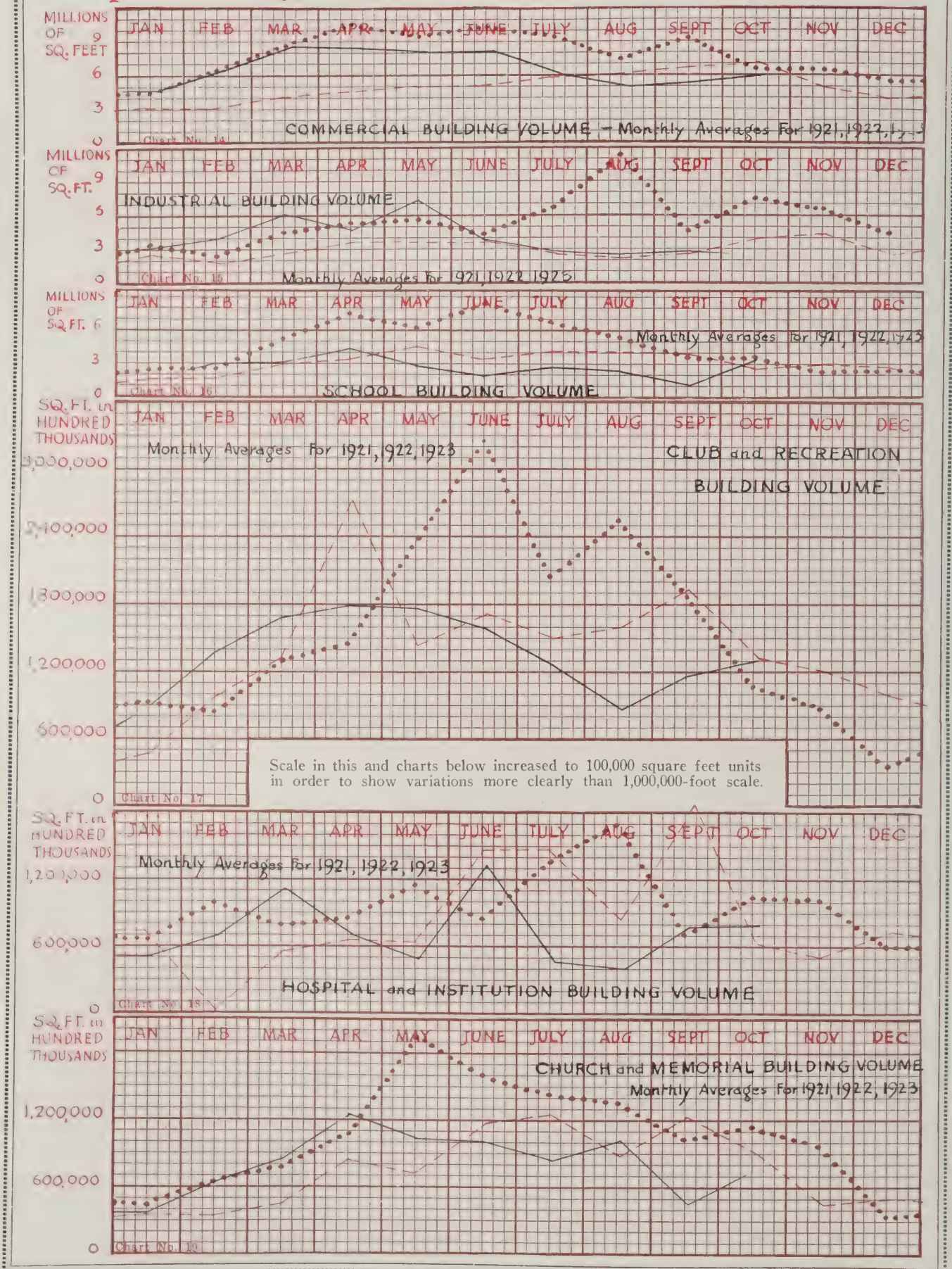
Graphic Analysis of 3 Years of Building Activity



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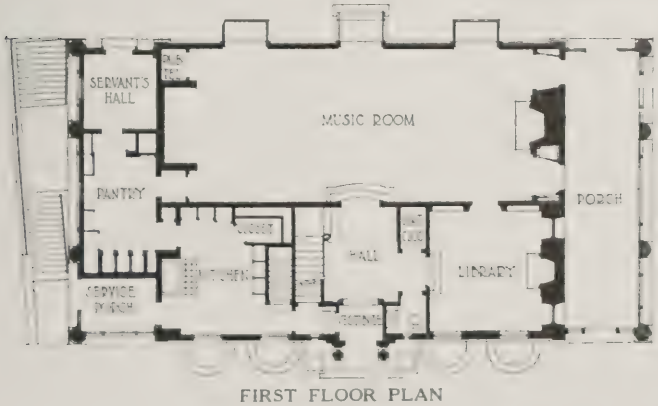
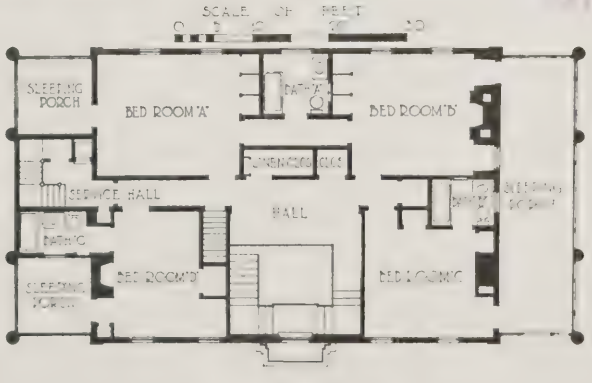
GENERAL VIEW OF STREET FRONT



FIRST FLOOR PLAN



SECOND FLOOR PLAN

HOUSE OF GEORGE F. LINDSAY, ESQ., ST. PAUL

PARKER, THOMAS & RICE, ARCHITECTS

DETAIL OF MAIN ENTRANCE

DETAIL OF GARDEN FRONT

HOUSE OF GEORGE F. LINDSAY, ESQ., ST. PAUL

PARKER, THOMAS & RICE, ARCHITECTS

FIREPLACE END OF MUSIC ROOM

DOORWAY TO HALL FROM MUSIC ROOM

HOUSE OF GEORGE F. LINDSAY, ESQ., ST. PAUL

PARKER, THOMAS & RICE, ARCHITECTS

TWO VIEWS OF THE GARDEN
HOUSE OF GEORGE F. LINDSAY, ESQ., ST. PAUL
PARKER, THOMAS & RICE, ARCHITECTS

VIEW FROM APPROACH

VIEW SHOWING SERVICE WING

HOUSE OF J. AVERELL CLARK, ESQ., WESTBURY, NEW YORK

PEABODY, WILSON & BROWN, ARCHITECTS

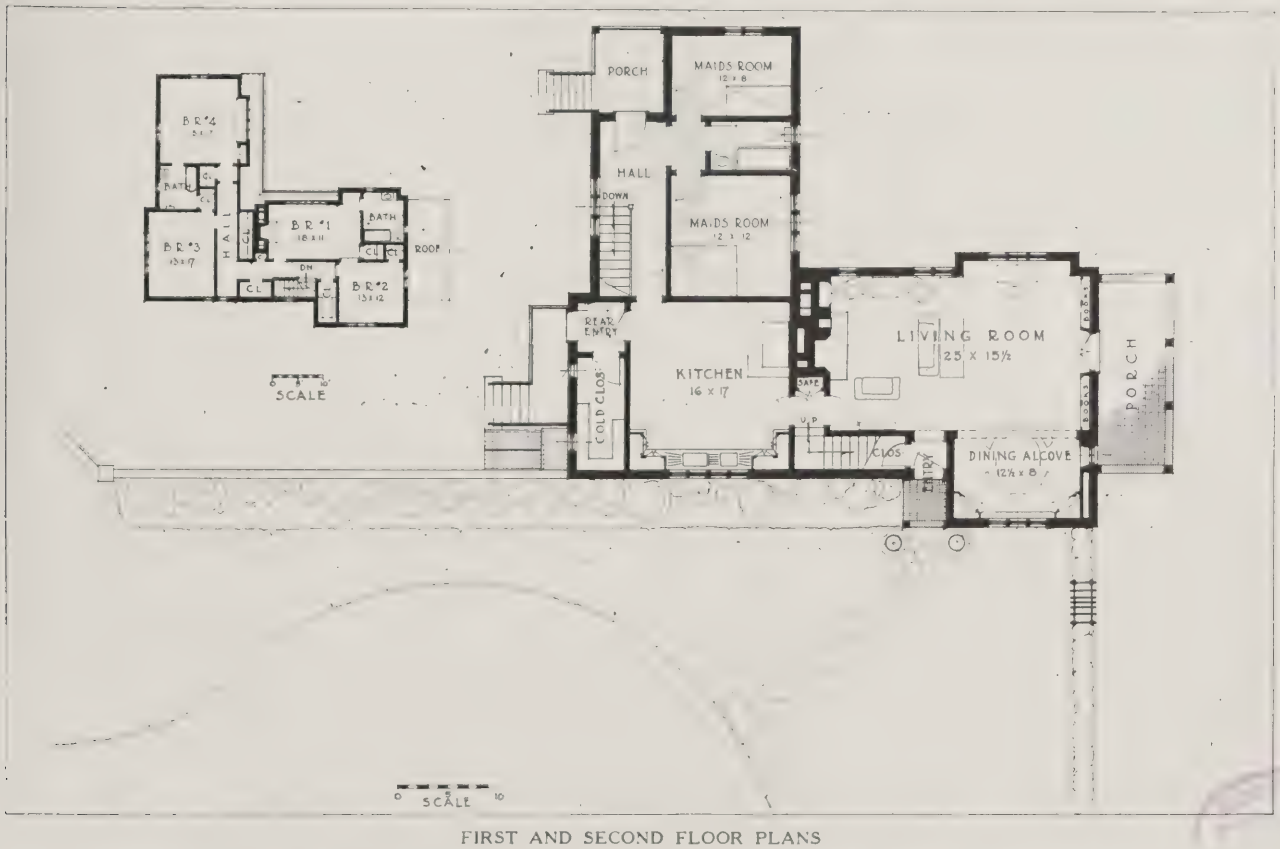
ENTRANCE DETAIL

DINING ALCOVE

HOUSE OF J. AVERELL CLARK, ESQ., WESTBURY, NEW YORK

PEABODY, WILSON & BROWN, ARCHITECTS

FIREPLACE END OF LIVING ROOM

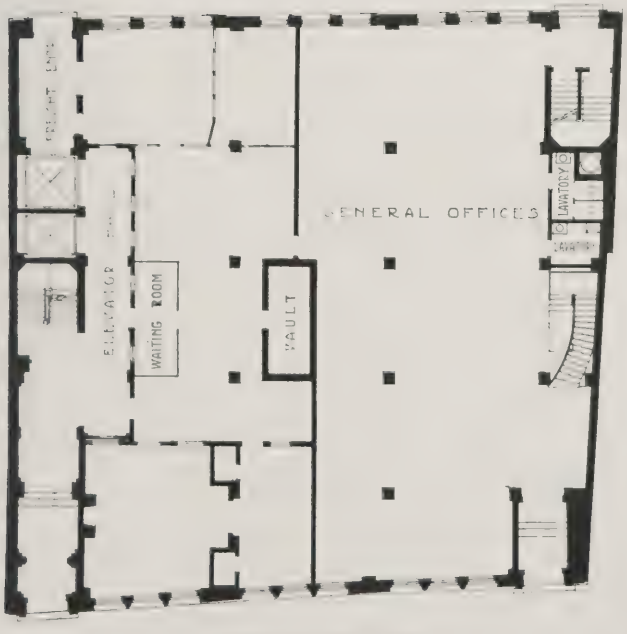


FIRST AND SECOND FLOOR PLANS

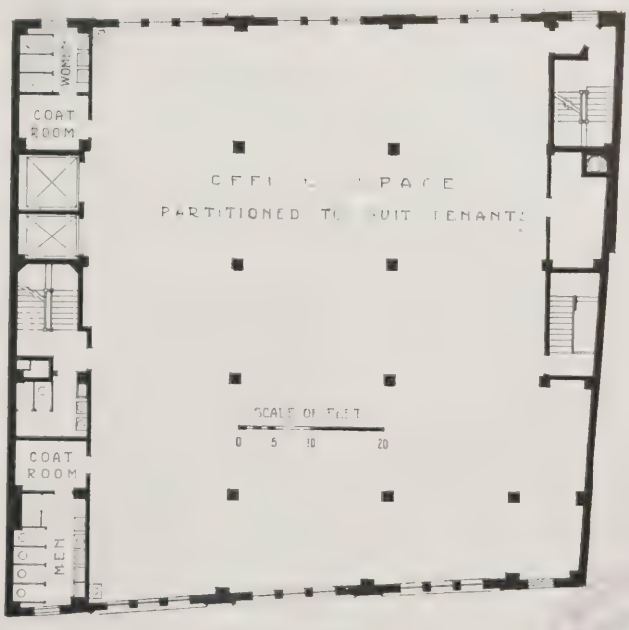
HOUSE OF J. AVERELL CLARK, ESQ., WESTBURY, NEW YORK

PEABODY, WILSON & BROWN, ARCHITECTS

DETAIL OF LOWER STORIES



FIRST FLOOR PLAN



TYPICAL FLOOR PLAN

TERMINAL WAREHOUSE, 31 SOUTH WILLIAM STREET, NEW YORK

JAMES W. O'CONNOR, ARCHITECT

DETAIL OF ENTRANCE

GENERAL EXTERIOR VIEW

TERMINAL WAREHOUSE, 31 SOUTH WILLIAM STREET, NEW YORK

JAMES W. O'CONNOR, ARCHITECT

Plate Description

Oakland Golf Club, Bayside, N. Y. Plates 97-101. Conditions were favorable in the case of the Oakland Golf Club, of which Roger H. Bullard is architect, for creating an interesting group of buildings. The type selected is that of the early American farmhouse, developed in a combination of shingles and field stone, both whitewashed, with roofs of moss-colored tiles, the grouping and composition being very much aided by the various retaining walls of stone which are necessary for providing upon rolling ground an area sufficient for buildings and dependencies so extensive.

The structure is fireproof, notwithstanding its shingled exterior walls, for the shingles are backed with hollow tile construction. The L-shaped plan of the building conforms to the character of the site, the main portion of the building having a southerly exposure overlooking the golf course. The service wing extends toward the north, with ample parking facilities at the main entrance court, traffic passing under the service wing and around this to the north to a lower parking level. In the basement provisions have been made for chauffeurs' sitting room, dining room, etc., with entrance from the service court. The second floor includes women's locker rooms over the lounge, card rooms over the dining room, and steward's room over the service wing.

The interior treatment is broad in its handling, with heavy ceiling beams and trusses of hand-hewn timber and boldly simple fireplace facings of limestone. Walls are in many instances treated in plaster applied in a free and irregular way as though on masonry, and then toned down by the application of wax glazed. The construction of the building makes possible window reveals of some depth, and excellent use has been made of the decorative opportunities by using red tile for the sills. A great part of the interest of the interior is due to the excellent taste which has guided the selection of furniture and accessories of every kind, which are an aid in giving character to the building.

House of George F. Lindsay, Esq., St. Paul. Plates 104-107. The popularity of the sleeping porch presents difficulties in the way of architectural composition which are not always as successfully solved as in this instance where it has been treated in the only consistent and logical way,—by regarding it as a part of the structure proper and not as an appanage. Here the architects, Parker, Thomas & Rice, have incorporated ample porches, upper and lower, at the ends of the house, treating them as integral parts of the body of the structure and extending the roof over them, thus adding materially to the width of the house and increasing the excellence of its proportions.

Exterior walls are covered with wide clapboards, and wood shingles are used upon the roofs. Much of the beauty of the exterior is the result of using gracefully designed wrought iron in the guards about windows and in the rail at the sides of the French window which opens from the music room upon the stone flagged terrace. Probably with a view to securing upon the lower floor one room of unusual size instead of two or more smaller rooms, considerable area has been given to the music room, one end of which, since it opens from the service quarters, can be made to do duty as a dining room. Upon the upper floor each of the four bedrooms opens upon a sleeping porch.

House of J. Averell Clark, Esq., Westbury, N. Y. Plates 108-110. With its excellent composition and rambling form, graceful roof surfaces, clustered chimneys and excellent use of walls to enclose gardens and service quarters, this house suggests an American adaptation of the "modern English style." The building is of stucco of moderate texture, whitewashed. The chimneys are of brick, also whitewashed, while the roofs are of wooden shingles, stained. The wall about the service portion of the house is, like the building itself, of stucco, whitewashed. What little wood trim is visible upon the exterior, is of oak which has been allowed to weather.

The plans of the house, of which the architects are Peabody, Wilson & Brown, illustrate a tendency which for several years has been noticeable in American country and suburban house building,—a tendency to minimize the number and sizes of the rooms on the lower floor to make possible the placing there of the necessary maids' rooms, thus leaving the entire upper floor for master bedrooms. Here the lower floor includes a living room of generous size, while the conventional dining room has been omitted, its place being taken by a "dining alcove."

Terminal Warehouse, 31 South William Street, New York. Plates 111, 112. That the value of good architecture is not entirely overlooked, even for structures which are not often regarded as presenting many opportunities for the exercise of care and skill in design, is being proved by the excellent designing being done for many structures of a strictly utilitarian nature. A case in point is this building, near the lower end of Manhattan Island, of which James W. O'Connor is architect.

The facade, eight stories high, is of brick with ornament of limestone about the doorways and windows of the two lower floors and the windows of the upper story. The structure has been planned for the storage of documents. The left half of the ground floor as one enters the building is occupied by the owning company; the remainder of this floor is leased to a single tenant, while each of the floors above is occupied by some individual tenant. The building is of steel construction, the facade as already said being of brick and stone; floors are of cement treated with a hardener.

EDITORIAL COMMENT

THE ARCHITECT AND CRAFTSMANSHIP

WE are wont to complain of the lack of craftsmanship in modern building practice, and it is true that by and large it is seriously lacking; yet do we readily recognize higher standards of workmanship when they do come to light today, and do we take sufficient advantage of opportunities for securing good architectural effects that are offered us in new materials and methods of construction?

Concrete construction is an instance. Its use structurally has been perfected within the time of the present generation, and within only the last few years has it been sufficiently developed with surface treatments to warrant its being considered a material suitable for architectural expression.

The memorial bridge at Wilmington, illustrated in this issue of THE FORUM, is an example of modern craftsmanship in a modern material. The entire structure is of reinforced concrete, and the whole exterior surface is likewise of concrete, poured in place with the exception of the balustrade, which was assembled from pre-cast concrete units. The surfaces display a range of finishes from simple carborundum rubbing on the soffits of the large arch ribs to a highly developed granite aggregate surface on the superstructure that has the appearance of being of stone and yet does not masquerade as stone, because the absence of joints and the simple character of ornament suggesting the wood forms with which it is made proclaim it to be monolithic. The architectural forms are classic and naturally suggestive of stone masonry; their construction in concrete has, however, not been overlooked, and they are greatly simplified to make them easy of manipulation with wood forms.

Architecture, unlike the other fine arts, cannot be created in tangible form by the artist who conceives it; the idea which the architect sets down on paper must be interpreted in varied materials by many and diverse kinds of workmen, building under the architect's supervision, before any work of architecture is completed. The possibilities of disappointment in the visual effect of materials, in the technique of building whereby certain expected textures are not developed, are legion and serve to indicate the powers of visualization that the architect must possess and exercise.

The selection of materials presents as much difficulty as any feature of architecture. Successful handling of material demands of the architect the power to judge from a small detached sample the effect of a large mass of material in the completed building, affected as the final appearance is by the important considerations of scale, color, and texture.

The close and intense study of mediæval and renaissance architecture that American architects have engaged in during the last 20 years has revived in us respect for the physical attributes of materials; we have learned that a brick building must claim interest first because of the character of its walls; that a stucco building must be of interest for the textured surfaces it displays; that a stone building must indicate that it is built of a natural material, with the slight variations of grain and color that a natural material possesses in evidence. Architectural beauty differs from natural beauty in that it is the result of a conscious effort to create beauty; it is governed by more or less defined laws of composition; it is artificial in nature, yet without adopting the sentimentalism of Ruskin it should not attempt to conceal the natural beauty of the materials that make it. Today, with the cost of construction exercising so strong an influence on architecture, it is of the greatest importance that the full beauty of materials be realized, because there is but little opportunity to fall back on use of ornament and elaborate architectural motifs.

Architects generally recognize this; the reason that evidence of it in finished buildings is so slight is that the building trades worker is still laboring under the delusions of the Victorian period of building, when the award of excellence was given to mechanical accuracy; the machine product age took away from the workman every artistic interest in the qualities of the material with which he worked; any effort that was made to recognize physical qualities of materials was always in the wrong direction, as witness the hideousness of polished golden oak.

Manufacturers, in the main, are similarly affected in their production by temporary and popular influences, irrespective of their being good or bad fundamentally. The manufacturer under present economic conditions must of necessity be governed by popular demand; much as he may appreciate better things than the normal market offers, he cannot be expected to spend his capital in an altruistic educational effort; he must make what his experience shows him will sell. On the architect, therefore, rests the whole responsibility for creating architecture. He must not alone conceive the design, but he must also expend his energy in developing a live interest in true and honest building methods, encourage the efforts of intelligent manufacturers, and give advice when possible to those laboring under false standards. Just as keen, live coöperation between designer, contractor and workman has developed concrete, so will the same effort build up standards of craftsmanship in the manufacturing and fabrication of all building materials. The effort is large, but the joy in creating a work of architecture is sufficient compensation.

This lovely grouping of Queen Anne pieces would be at home in a stately house of Georgian character

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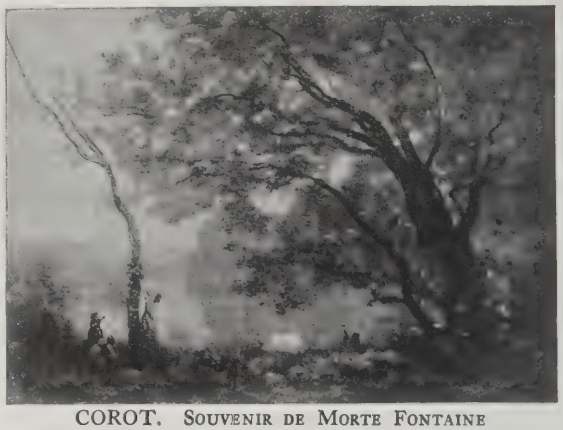
John Ruskin



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Living-room in country home of Jules Breuchaud, Ulster Co., N. Y. Selected from Keefe's AMERICAN HOUSE. © U. P. C. Book Co.

A true concept of old Dutch interiors

THE inviting interiors of the Breuchaud house are admirable examples of old Dutch work. In his choice of decorative elements, the architect, Mr. Myron S. Teller, of Kingston, N. Y., has happily caught the spirit of the old Dutch craftsmen. Particularly do the walls and woodwork of the living-room pictured above reflect the traditional Dutch simplicity.

As a permanent base, the plaster side walls received three coats of Dutch Boy white-lead and linseed oil tinted a warm gray with lampblack, chrome yellow, yellow ochre, and raw umber. For the finishing coat the same color was used, but the white-lead was mixed with flatting oil instead of linseed oil to give a flat finish.

To secure a harmonious contrast both for color and tone effect, the woodwork and beamed ceiling were then painted an ivory white with an eggshell-gloss finish. This finish was put on over a lead and linseed oil base.

For the pleasingly simple or the most ornate decorative scheme, Dutch Boy white-lead has unlimited possibilities. Mixed with linseed oil for gloss effects or with Dutch Boy flatting oil for flat and semi-gloss effects, it forms a paint that spreads far and retains its color tone for years.

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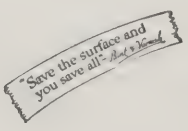

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FOR INTERIOR AND EXTERIOR PAINTING

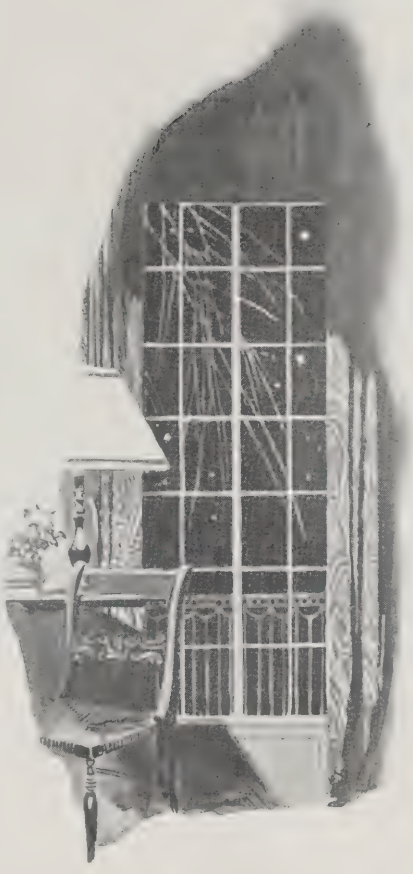
TOILES de RAMBOUILLET

An unusual group of hand-blocked linens from France as distinctive as the famous Toiles de Jouy

THE fascinating designs printed in Oberkampf's workshop at Jouy, France, created a vogue which the intervening years have failed to dim. Today Toiles de Jouy are as famous, as much prized as they were back in the late 18th Century when they first appeared.

Now has come a new series of French printed linens as distinctive in their way as the Toiles de Jouy. Several French artists of note, exhibitors in the important Salons, are creating the designs for this new group called Toiles de Rambouillet after the ancient chateau so closely linked with the history of France.

One of the artists who is creating designs for the Toiles de Rambouillet series composed and painted the cartoon from which is being woven the Gobelin tapestry commemorating the participation of the United States Army in the World War. This will decorate one of the rooms in the White House. Two of the artists are pupils of Puvis de Chavannes, the French master of modern mural decoration who is represented in this country by several notable murals in the Boston Public Library.



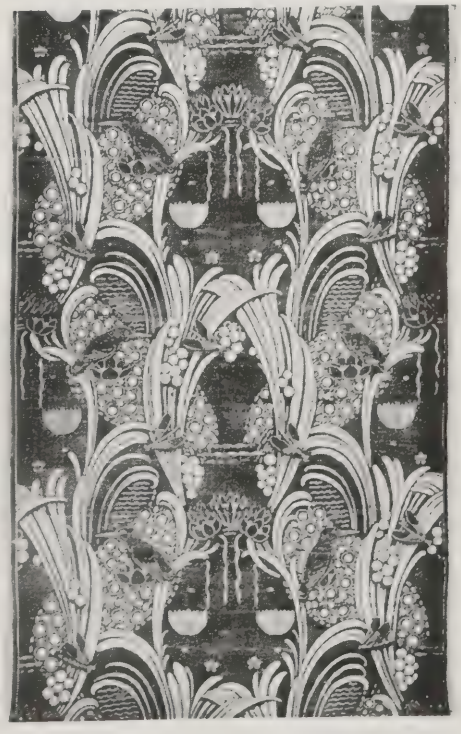
A group of modern French artists created the designs for Toiles de Rambouillet, the unusual series of printed linens recently imported by Schumacher. The design at the left is hand-printed in two soft colors with charming irregularity.

Each design is hand-printed on linen, not in a hard, flat way but so as to produce a mottled, uneven effect. At times the colors are light, fresh, almost transparent; again they are soft, subdued, mellow like those in an antique piece. Often the artist has chosen to have his design printed in only one color, sometimes two — rarely more than three. The designs themselves are well balanced compositions full of grace and variety done with the freedom of execution which characterizes real mastery.

This simplicity of coloring and the choice designs distinguish Toiles de Rambouillet, set them apart from all other printed linens and indicate a potential vogue as great as that of the Toiles de Jouy.

The first group of Toiles de Rambouillet has just been imported. This notable series is exclusive in the United States with F. Schumacher & Co., Importers, Manufacturers, Distributors to the trade only, of Decorative Drapery & Upholstery Fabrics. 60 West 40th Street, New York. Offices in Boston, Chicago, Philadelphia.

Particularly effective is the design at the right, hand-printed in two colors. Toiles de Rambouillet are appropriately used at windows, as wall panels, and as covers for chairs and couches. Wherever they are used in a room they add a distinctive touch which no other fabric can give.



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The simple nobility of walnut finds eager users among the discriminating architects who are surfeited with the florid ornamentation of a few years past. For today we have traveled forward, not back, to nature herself for inspiration in decoration. There is the source of all beauty, and American Walnut is one of nature's loveliest manifestations.

Here in the dining room of the J. Hoyt Smith residence at Milwaukee, Wisconsin, ceiling-high panels of walnut, waved and convoluted in the most fascinating manner, bring nature's art to aid the architect's design. The cool white of a marble fireplace gives sudden contrast to the sun-stained tone of the wood, and above, cream plaster relieves the walnut beams that span the ceiling, in the same manner.

It is in rooms such as these that the architect achieves his ideal, for he relies on the subtlety of walnut's power of decoration rather than man's.

We wish to send you "The Walnut Book"—a treatise on the history and development of walnut in interior decoration. Will you ask us for it, please, and also American Walnut specification notes for interior trim?

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Room 1000, 616 S. Michigan Ave., Chicago, Ill.

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Erected at end of Eighteenth Century

INTERIOR DOORWAY
Nichols House, Salem, Mass.
Illustrations from the book, "Eight Periods and Their Modern Adaptation"

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THE great popularity of the colonial style for modern house interiors is well deserved. It has features of simple beauty, fitness, and economy to commend it. The surface of paneling, doors, and trim is a large factor in obtaining the colonial effect; beauty must be achieved in that as well as in mouldings and proportions, and a finish must be selected that will have long wearing qualities. Murphy Muronic Enamel meets these demands; it is a product of the experience of over a half century of fine varnish and enamel making. Its heavy body and easy flowing quality give a surface without trace of a brush mark—a surface that accords with the finest colonial detail.

"EIGHT PERIODS AND THEIR MODERN ADAPTATION," a book which treats of the popular decorative periods and presents for the first time in definite form complete specifications for period wood finishes, will be mailed to any architect at his request.

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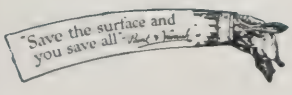

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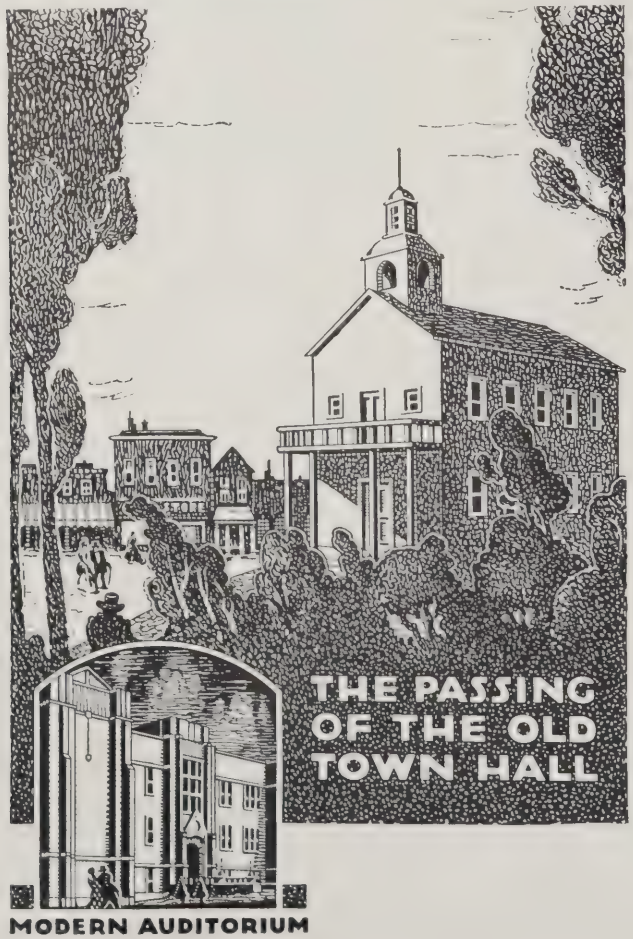

MODERN AUDITORIUM

THERE is a marked contrast between the Old Town Hall and the Modern School Auditorium. In the old days, the Town Hall opened its draughty interior for Lyceum and lecture courses and other entertainments during the long winter evenings. Today the School Auditorium is functioning for community interests and activities. Yesterday the Town Hall was seated with rickety, worn, and ill-shaped chairs or benches, inimical to the children's health and adult comfort.

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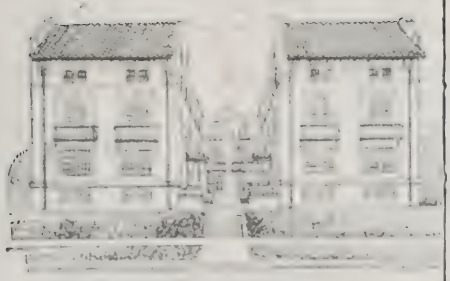

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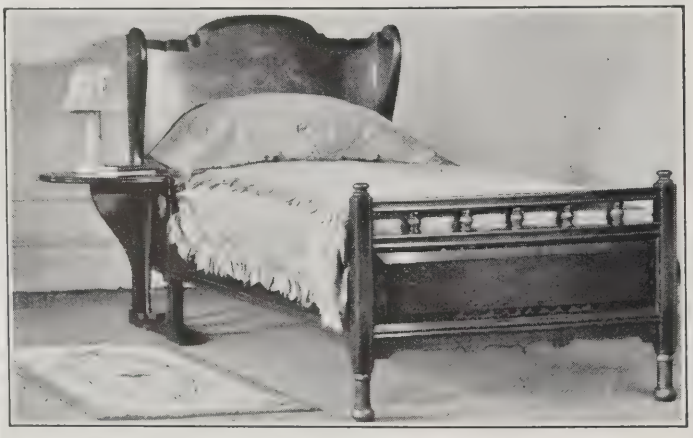

The Danersk Salem Bed—a contribution to furniture design

This dresser expresses individuality that means real charm

Salem Tray Chest—with perfect proportion of panels

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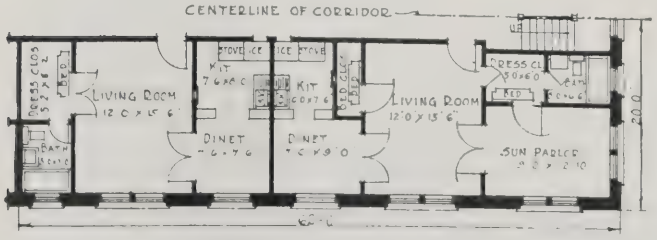
Floor plan showing 2 typical units



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CONCRETE WALLS	S-W Concrete Wall Finish	Old Dutch Enamel, Gloss		
CEMENT FLOORS	S-W Concrete Floor Paint	S-W Concrete Floor Paint		
EXTERIOR WOOD SURFACES	SWP (Sherwin-Williams Prepared Paint)	Old Dutch Enamel, Gloss	S-W Preservative Shingle Stain S-W Acid or Oil Stain	Rexpar Varnish
EXTERIOR METAL SURFACES	Kromik Structural Steel Primer Metalastic (for finishing coats)	Old Dutch Enamel, Gloss		
FACTORY WALLS (Interior)	S-W Eg-Shel Mill White S-W Fume Resisting White	Old Dutch Enamel or Enameloid		
FLOORS (Interior Wood)	S-W Inside Floor Paint (the enamel-like finish)	S-W Inside Floor Paint (the enamel-like finish)	Oil Stain or Floorlac Varnish Stain	Mar-Not Floor Varnish
GALVANIZED IRON SURFACES	S-W Galvanized Iron Primer (Finish with any Paint)	S-W Galvanized Iron Primer and Old Dutch Enamel		
INTERIOR WALLS AND CEILINGS	Flat-Tone Wall Finish S-W Semi-Gloss Wall Finish	Old Dutch Enamel or Enameloid		
INTERIOR WOOD TRIM	SWP (Sherwin-Williams Prepared Paint)	Old Dutch Enamel or Enameloid	S-W Acid Stain S-W Handcraft Stain S-W Oil Stain	Scar-Not Varnish Velvet Finish Varnish (for imitation rubbed effect)
PORCH FLOORS AND DECKS	S-W Porch and Deck Paint			
RADIATORS AND PIPES	Flat-Tone Wall Finish or S-W Gold Paint S-W Aluminum Paint	For White—S-W Snow White Enamel For colors—Enameloid		
ROOFS—Metal	SWP or Metalastic (if Galvanized, prime with S-W Galvanized Iron Primer)			
ROOFS—Wood Shingle	SWP		S-W Preservative Shingle Stain	
STACKS AND HOT SURFACES	Salamander Smoke-Stack Black			
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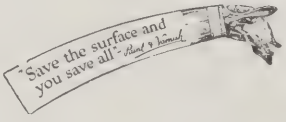

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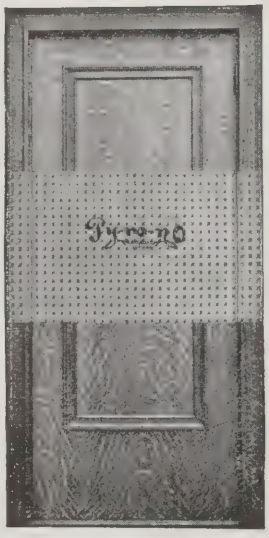

Magnified section before veneer is applied

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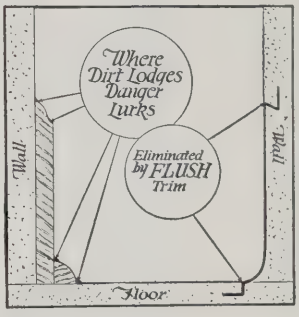
flush



Knapp Sanitary Metal Trim *is* sanitary—because it sits *flush*: flush with wall, flush with floor. If there were any corners or ledges, dirt would collect, germs would gather—true sanitation would be defeated.

But *flush—sealed* as it were, and substituting *curves* for corners throughout the room—Knapp Sanitary Metal Trim defies dirt and germs—and along with cleanliness brings to every room true durability, maintenance economy, and decorative beauty.

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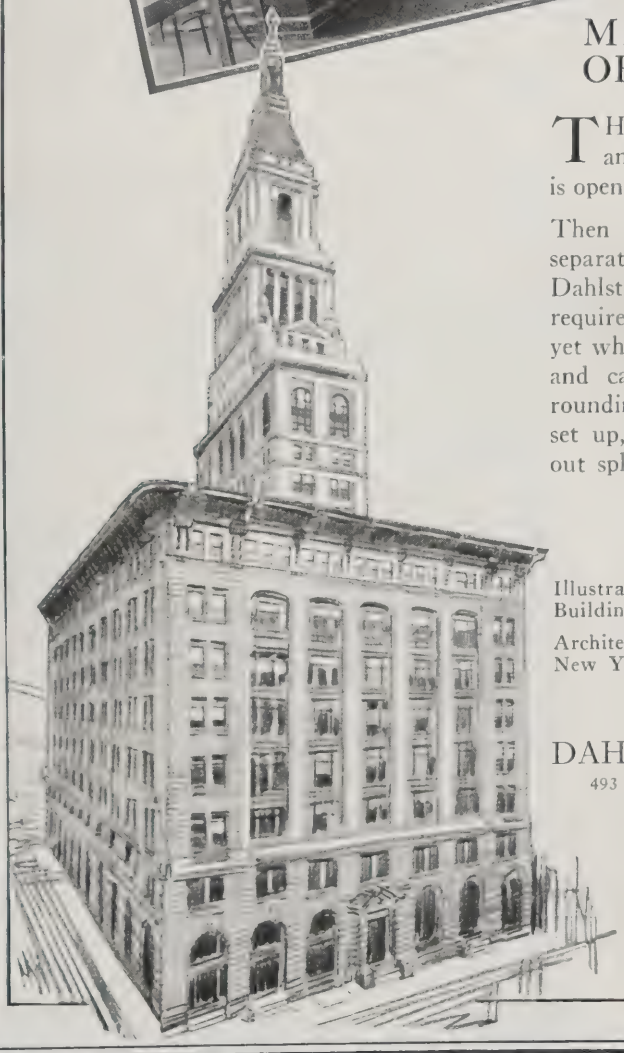

Illustrating Travelers Insurance Building, Hartford, Conn.

Architect, Donn Barber
New York City

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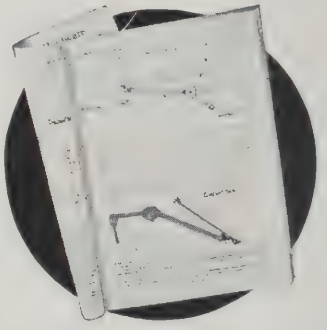

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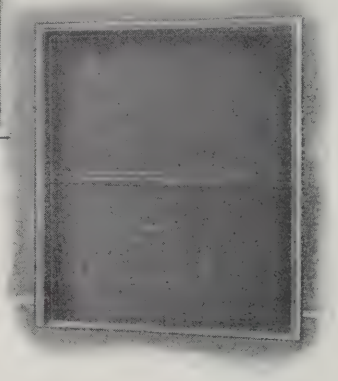

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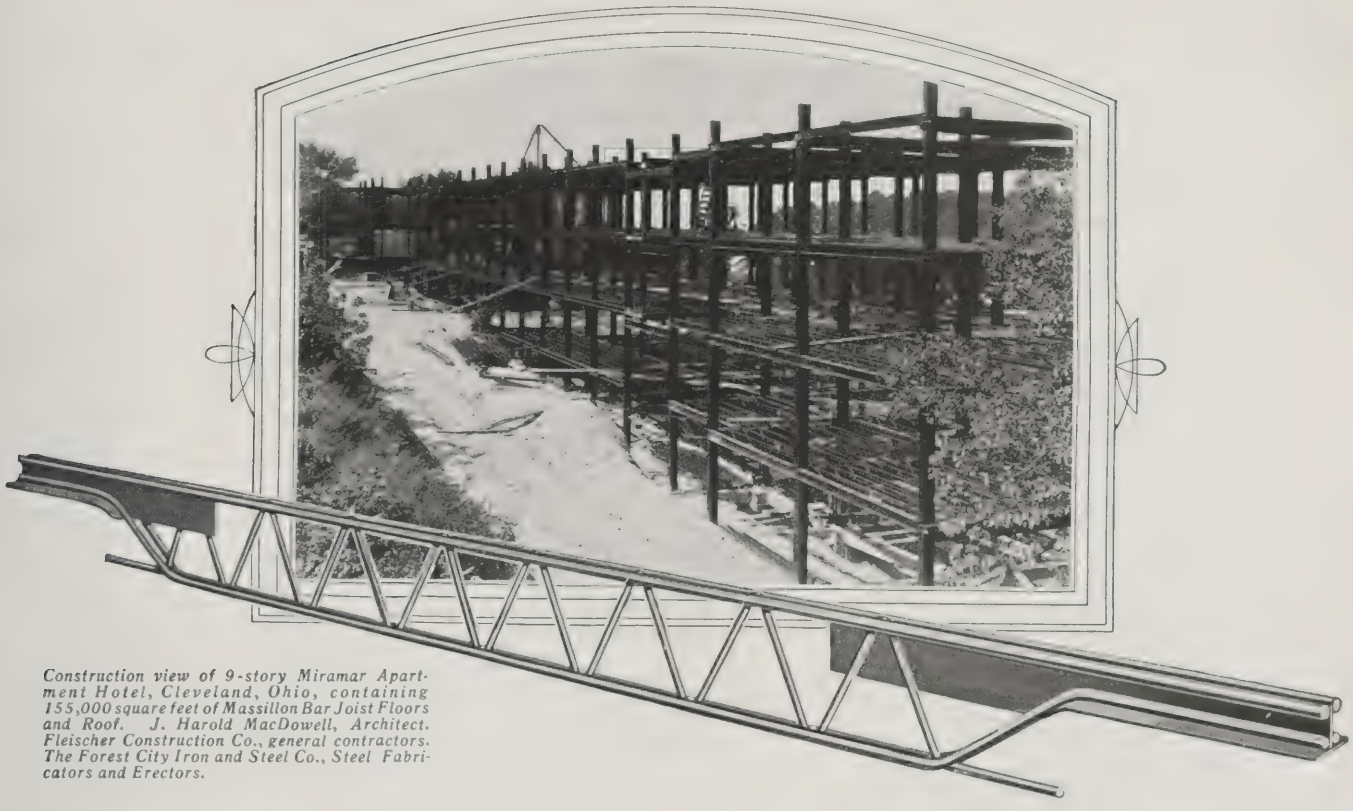

Construction view of 9-story Miramar Apartment Hotel, Cleveland, Ohio, containing 155,000 square feet of Massillon Bar Joist Floors and Roof. J. Harold MacDowell, Architect. Fleischer Construction Co., general contractors. The Forest City Iron and Steel Co., Steel Fabricators and Erectors.

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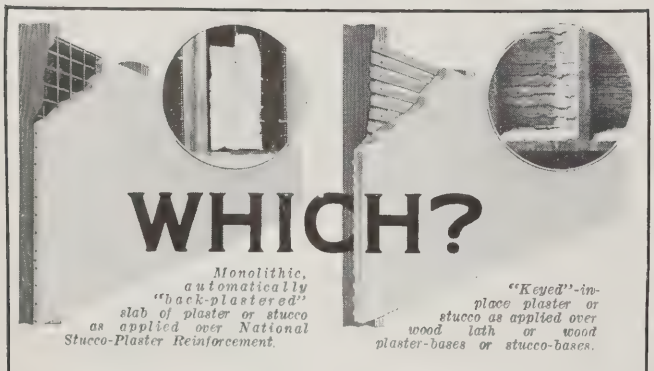

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Information on economic aspects of construction and direct service for architects on subjects allied to building, through members of THE FORUM Consultation Committee

The Building Situation

THE trend lines for October, as indicated in the chart below, picture an unusual condition —an early winter building boom. From June to October of this year the investment and volume of new building had been dropping steadily from month to month. The recovery to be noted in October is several months earlier than the similar reaction during the past few years. It is to be noted that this sudden increase in building activity is found largely in the East, particularly in New York and northern New Jersey.

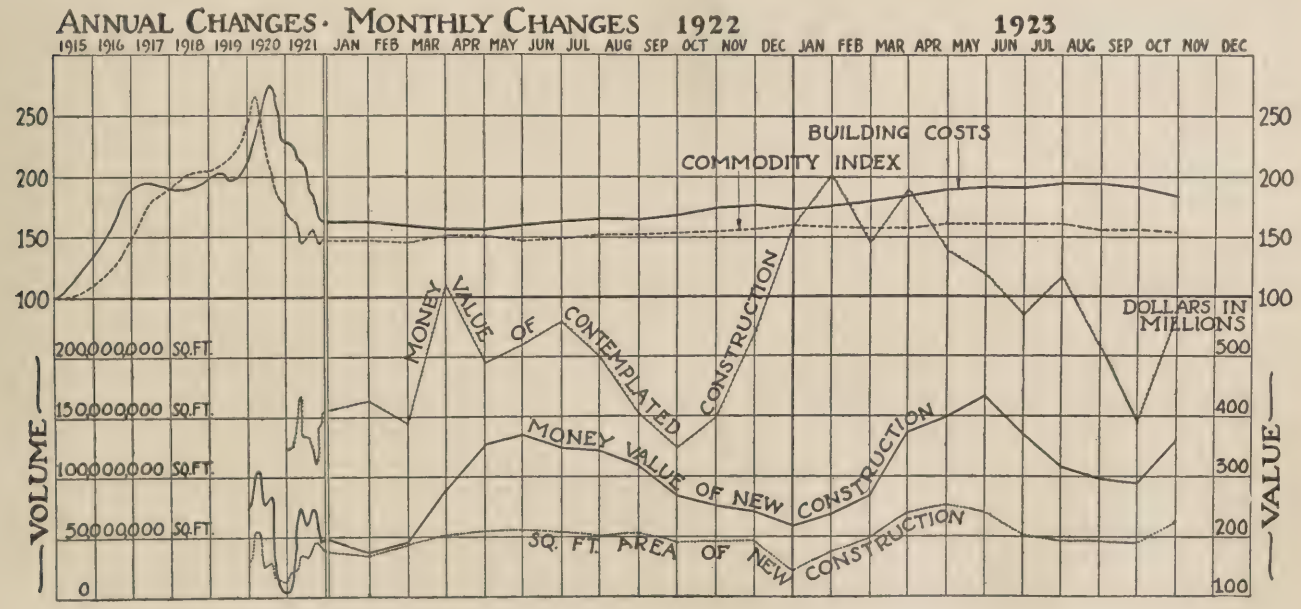
The type of building influenced by this activity is primarily residential, and there are several interesting reasons for the appearance of another building boom at this time. Probably the most fundamental reason is that large real estate operators have been watching the winter market to learn the attitude of the public in renting apartment building space this fall. Practically all buildings in the New York area have been filled without any material reduction in rentals, and this has caused a great many large projects to come into the building market now.

A strong influence on this situation we believe to have been a more intelligent consideration of the possibilities of winter building. This has been the subject of a deliberate effort on the part of architects, contractors and bankers to eliminate peak of activity in the building industry and spread out the work in a manner more beneficial to all concerned.

The line indicating contemplated construction for an ensuing period has also shown a sharp up-turn, which continues through November, as will be indicated on the chart presented next month.

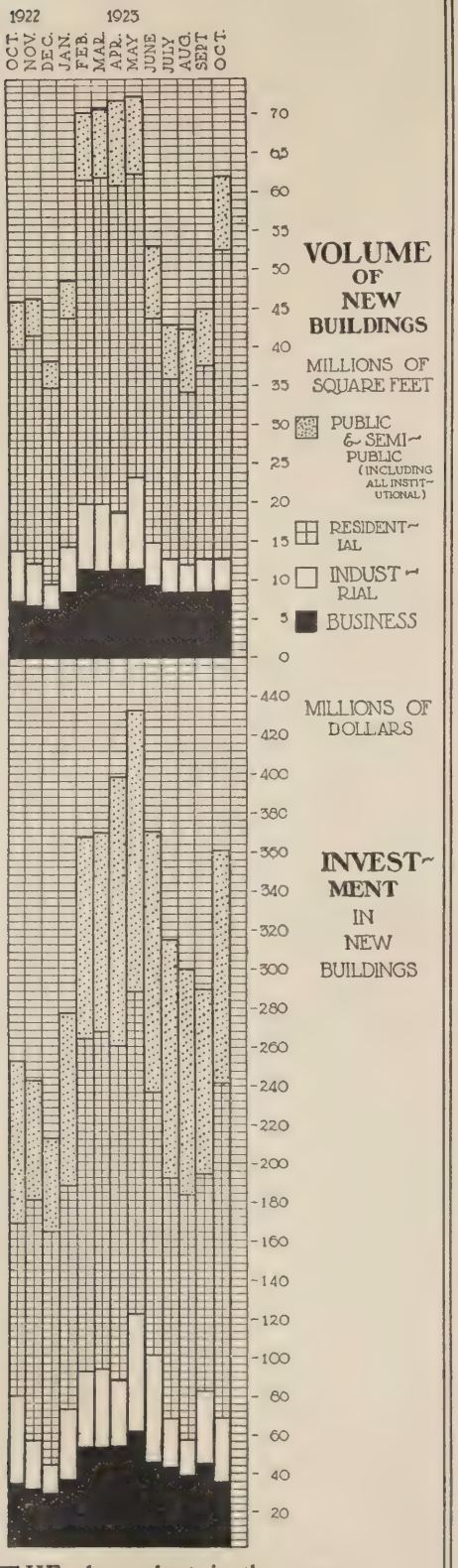
In examining this line in the chart below it will be found that a definite movement in actual new building investment has followed a sharp upward turn of the trend line, taking the money value of contemplated construction which is based on the value of new plans filed throughout the country.

Beginning on page 306 of this issue will be found a complete analysis of the unusual building activity of the past three years.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction.* Value of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Co., and *Engineering News-Record.* (4) *Money Value of New Construction.* Total valuation of all contracts actually let. The dollar scale is at the right of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the left of the chart. The variation of distances between the value and volume lines represent a square foot cost which is determined first, by the trend of building costs, and second, by the quality of construction.

BUILDING VOLUME AND INVESTMENT RECORD



THE above chart in the upper part indicates the approximate division of the money invested in new building, and in the lower part the number of square feet represented by new construction. Building construction is divided into four general classes, permitting the relative importance of each field to be visualized, while the total of each monthly column shows the entire volume of investment.

MONTHLY TREND OF BUILDING COSTS

Believing that Dec. 1 will mark the turn of basic building material price movements upward, somewhat as May 20, 1920, marked the peak bend downward of the same commodities, the current Dow Service Daily Building Reports compare record high levels with those of Sept. 1 of this year, when the autumnal price slumps usually occur, together with closing November, 1923, prices.

Basic building materials that recently recorded price cuts, like cement and brick, are edging for higher prices. Lumber, sand, gravel and crushed stone and glass feel the pressure of an unexpected winter demand. Metals are not so plastic in the buyers' hands and New Jersey terra cotta fireproofing finds a healthy market here for big operations in spite of a price cut on Western made competing materials.

Searching for tangible reasons for these most unusual fall building market conditions The Dow Service Daily Building Reports show that national permits granted this year as compared with the same ten months show a gain of approximately a hundred million dollars resulting in a state of unpreparedness as far as basic national building material domestic reserves are concerned without contemplating Japanese disaster reconstruction needs.

Cement stocks on hand ten months ended Oct. 31 are only 448,000 barrels in all the mills of the country in excess of last year's stocks on hand Nov. 1, in spite of a winter demand for this material twice as great as that of a year ago.

This, too, in the face of a production in the first ten months of this year of 114,366,000 barrels as against 93,850,000 barrels in the same period in 1922, and shipments 118,892,000 barrels this year as against 101,538,000 a year ago.

Lumber, by way of illustrating the effect this out-of-season building movement has had upon building material reserves, shows a 1923 cut in ten months of 12,147,320,940 board feet against 10,306,851,045 in the same months last year and shipments of 11,597,635,523 board feet this year versus 9,707,553,141 board feet shipped last year. A national lumber reserve of less than a billion board feet bans further price drops, with a building construction movement double the dimensions of last year's building program.

New York, for example, showed last Thursday 45,000,000 domestic common brick being carted to jobs as against only 37,500,000 at this time last year.

The effects of this situation upon New York prices (and other cities throughout the country in proportion) is shown herewith:

	May 24, 1920.	Sep. 1, 1923.	Dec. 1, 1923.
Asphaltum (car lots) (T).....	$30.00	$22.50	$22.50
Brick-Common, Dom. (M) Whsl.	25.00	20.00	18.00
Cement (Bbl.) Del.	4.50	3.20	3.10
Fireproofing Face Brick (M) Del. H'rv'rds	60.00	48.00	47.00
(Hollow tile) T. C. (Mpcs.)	370.00	189.50	176.00
Gypsum block 4" Hol. (pc.)	.175	.165	.165
Glass — Disc'ts off job list...	*65	*77-*78	*81
Do — Window as above...	*76	*85	*88
Gravel ¾" Cu. Yd. del'd....	$3.50	$3.25-$3.50	$3.25
Lath — Wood (M)	20.00	10.50	10.00
Lime, Finishing (bbl.) del ...	5.00	4.50	4.50
Do common (bbl.) do...	4.80	4.10	4.00
Do Hydrate fin. del. (T)	26.00	26.00	26.00
Do Com. (T) del.	22.00	21.50	21.00
Lumber—			
Y. P. flooring A sap. rift (M) ft. del.	182.50	115.00	110.00-115.00
L. L. Y. P. rough tim., 21' & under, del.	85.00	65.00	62.00-65.00
T. & G. N. C. pine roofers ⅞x5½" (M) ft. del.	72.50	45.00	40.00
No. 1 Maple flg. (M) ft. del.	225.00	120.00	120.00
Metals—			
Str'ctural stl. beams, c'ts per pound Pitts.	.0310	.025	.025
Plates, Pitts. (Tank)	.0375	.125	.025
Nails (per keg) Pitts. wire	3.10	3.00	3.00
Oil — Linseed (G) to trade less than 5 bbl. lots ...	1.66	.97	.98
Sand — Cow Bay, Del. (cu. yd.) s'w lots	2.75	2.75-3.00	3.50
Stone — Ind. limestone (St. gray) cu. ft. trade N. Y...	1.36	1.47	1.47

*Per cent.

ANALYZING THREE YEARS OF BUILDING ACTIVITY

In the first editorial section of this issue of THE ARCHITECTURAL FORUM there will be found an 8-page article with 19 graphic charts which form a complete analysis of the unusual building activity which has taken place during the years 1921, 1922 and 1923.

Anticipated building for 1924 will be discussed in the January (next) issue, based on the assembling and correlating of nearly 2,000 confidential reports from architects throughout the country.

BUILDING MATERIAL PRICES

Table Showing Average Prices Paid by Contractors for Building Materials at Local Distributing Points as of October 1, 1923. Prepared by Division of Building and Housing of the Department of Commerce from Prices Secured through the Bureau of Census

Commodities	Size or Condition	Unit	Mass. Fitchburg	Mass. Haverhill	Conn. New London	Penn. Pittsburgh	Penn. Erie	Md. Baltimore	Va. Richmond	W. Va. Fairmont	S. C. Columbia	Ga. Savannah	Mich. Detroit	Mich. Pontiac	Mich. Saginaw	Mich. Bay City	La. Shreveport	La. New Orleans	N. Dak. Grand Forks	S. Dak. Sioux Falls
Common Brick		1,000	24.00	$24.00	$30.00	$17.00	....	$20.00	$19.00	$26.00	$12.00	$14.00	$17.50	$16.00	$15.00	$18.00	$15.00	$17.75	$15.00	$18.00
Portland Cement	Excl. of containers	Bbl.	3.25	3.60	3.60	3.10	3.40	2.85	3.50	2.85	4.00	3.30	3.72	....	3.30	2.85	3.20	3.00	3.80	....
Yellow Pine No. 1	Dimension 2x4-16′ S1S1E	M	....	....	....	50.00	52.00	40.00	32.00	....	....	30.00	55.00	50.00	55.00	50.00	46.00	45.00	....	....
Douglas Fir No. 1	Dimension 2x4-16′ S1S1E	M	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	50.00	47.00
No. Carolina Pine No. 1	Dimension 2x4-16′ S1S1E	M	....	....	....	....	52.00	....	....	53.00	25.00	....	....	....	....	....	....	....	....	....
Common Boards No. 1	1x6	M	55.00	55.00	45.00	47.00	48.00	40.00	32.00	51.00	25.00	30.00	55.00	50.00	....	48.00	50.00	45.00	48.00	47.00
Y. P. Flooring Edge Grain "C"	1x4-10′-16′	M	....	130.00	....	74.00	....	....	....	....	100.00	....	....	75.00	80.00	85.00	....	75.00	....	....
Douglas Fir V. G. No. 2	1x4-10′-16′	M	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	95.00	85.00
Red Cedar Shingles	Extra clear 16″ 5 to 2	100 sq. ft.	....	6.40	6.00	6.25	7.00	11.20	7.20	7.25	....	....	6.40	7.00	7.50	7.00	....	7.50	5.00	5.20
Cypress Shingles	Extra clear 16″ 5 to 2	100 sq. ft.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6.75	....	....	....
Composition Shingles	Crushed slate surfaced	100 sq. ft.	....	....	....	6.25	6.50	6.00	5.48	6.25	6.25	6.50	7.25	7.00	6.00	6.00	7.70	....	....	7.50
Gypsum Plaster Board	⅜″	1,000 sq. ft.	....	50.00	50.00	37.50	45.00	32.50	40.00	32.00	37.00	37.50	30.00	40.00	45.00	40.00	45.00	45.00	....	32.00
Lime	Hyd. Com.	Ton	24.00	20.00	26.00	23.00	22.00	15.00	17.50	16.00	20.00	20.00	20.00	16.00	20.00	16.00	25.00	....	25.00	24.00
Building Sand		Cu. yd.	1.80	2.50	1.65	2.50	3.00	2.50	2.25	3.75	1.25	2.00	2.75	1.50	2.75	2.50	2.25	2.00	3.00	....
Crushed Stone	¾″	Ton	3.25	2.50	....	5.50	3.00	....	....	3.00	2.75	4.40	2.35	....	3.50	3.80	4.32	3.25	....	....
Wire Nails		Keg	4.10	5.00	5.05	3.50	3.65	3.75	4.05	4.00	4.25	4.05	4.00	3.75	3.80	3.85	4.60	3.75	5.50	....
Window Glass	Single A 10″x12″	50 sq. ft.	....	....	4.27	4.80	....	....	5.80	5.25	....	....	6.25	....	4.25	5.00	5.10	4.00	....	....
Hollow Tile	8″x12″x12″	Each	....	.30	.32	.20	.24	.24	.20	.26	.18	....	.20	.18	.20	.18	.22	.24	....	.19
Cast Iron Soil Pipe	4″ E.H. 13 lbs. per ft.	Ton	....	....	....	55.00	....	62.00	....	88.00	....	....	64.96	....	69.80	90.00	106.25	75.00	....	....
Steel Pipe	1″ galv.	100 ft.	....	....	....	9.86	....	9.88	10.00	10.00	11.87	9.46	8.50	9.00	10.66	9.75	11.95	9.97	....	....
Reinforcement Bars	¾″ square	100 lbs.	3.75	....	....	4.00	....	3.55	3.35	3.50	4.50	5.00	3.50	3.50	3.75	3.70	4.00	3.75	....	....
Structural Steel	Fab. 6″ I-beams	100 lbs.	....	....	....	3.25	....	3.63	4.50	6.00	4.75	5.00	7.00	4.50	5.60	4.90	6.50	3.90	....	....
White Lead	Dry	100 lbs.	....	14.00	14.50	14.00	....	....	....	14.25	14.75	14.75	14.00	13.00	14.30	13.00	15.00	12.50	18.00	....
Zinc Oxide	Am. process lead free	100 lbs.	....	....	....	15.00	....	....	15.00	....	19.00	20.00	....	....	18.00	19.00	....	....	....	....
Gypsum plaster	Neat	Ton	24.00	....	26.00	22.00	24.00	19.50	....	19.00	20.00	20.00	....	17.00	20.00	17.50	24.00	22.00	27.00	14.50
Linseed Oil	Raw in bbls.	Gal.	....	1.08	1.35	.96	....	.95	1.12	1.30	1.15	1.00	1.05	1.15	.98	1.20	1.35	1.15	1.50	....
Roofing Slate	No. 1 ribbon	100 sq. ft.	....	....	....	13.50	....	....	13.50	12.50	....	....	....	17.00	17.00	17.00	12.00	15.25	....	....
Tar Paper, Roofing	2-ply 75 lbs. per roll of	100 sq. ft.	....	3.00	....	1.95	....	....	....	....	....	....	....	2.75	2.75	2.85	2.75	3.50	....	3.75
Rosin Sized Sheathing	3-ply 30 lbs. per roll of	500 sq. ft.	....	1.75	....	1.35	1.40	1.75	1.50	1.25	....	1.00	1.40	1.00	1.15	1.20	1.40	1.35	2.00	1.50

Commodities	Size or Condition	Unit	New York Poughkeepsie	New York Schenectady	New York Rochester	New York Buffalo	Ohio Cleveland	Ohio Akron	Ohio Lorain	Ohio Dayton	Iowa Waterloo	Iowa Des Moines	Iowa Council Bluffs	Wash. Spokane	Wash. Seattle	Ore. Portland	Wis. Milwaukee	Ariz. Tucson	Cal. Los Angeles	N. J. Newark
Common Brick		1,000	20.00	25.00	17.75	23.00	16.00	16.00	23.50	15.50	16.50	19.00	16.50	....	18.00	20.00	13.50	15.00	15.00	18.00
Portland Cement	Excl. of containers	Bbl.	3.30	3.25	3.35	3.03	3.48	3.50	3.60	3.12	3.00	3.40	....	....	3.00	3.00	2.66	4.40	3.36	3.50
Yellow Pine No. 1	Dimension 2x4-16′ S1S1E	M	....	52.00	48.00	55.00	57.00	45.00	53.00	55.00	52.00	52.00	50.00	....	....	....	43.00	....	....	47.50
Douglas Fir No. 1	Dimension 2x4-16′ S1S1E	M	49.00	....	56.00	60.00	....	....	....	55.00	50.00	52.00	48 00	30.00	23.00	23.00	....	65.00	41.50	....
No. Carolina Pine No. 1	Dimension 2x4-16′ S1S1E	M	....	....	48.00	....	....	....	....	52.50	....	....	....	....	....	....	....	....	....	....
Common Boards No. 1	1x6	M	40.00	45.00	45.00	50.00	49.00	45.00	48.00	....	46.00	58.00	48.00	....	24.00	24.00	42.00	60.00	40.00	50.00
Y. P. Flooring Edge Grain "C"	1x4-10′-16′	M	....	120.00	130.00	85.00	92.00	....	....	90.00	95.00	105.00	112.00	....	....	....	....	....	....	95.00
Douglas Fir V. G. No. 2	1x4-10′-16′	M	....	....	....	115.00	....	....	....	....	95.00	95.00	100.00	80.00	66.00	55.00	....	100.00	82.75	....
Red Cedar Shingles	Extra clear 16″ 5 to 2	100 sq. ft.	....	6.50	6.00	6.75	6.00	6.00	....	6.20	6.50	6.75	6.25	....	3.75	....	6.25	5.60	....	6.50
Cypress Shingles	Extra clear 16″ 5 to 2	100 sq. ft.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Composition Shingles	Crushed slate surfaced	100 sq. ft.	....	7.25	....	....	6.20	5.75	....	6.50	7.50	6.00	....	....	....	6.60	6.75	....	....	6.75
Gypsum Plaster Board	⅜″	1,000 sq. ft.	50.00	45.00	30.00	45.00	....	27.60	....	32.50	36.00	42.00	....	....	35.00	36.63	42.00	....	35.00	45.00
Lime	Hyd. Com.	Ton	22.00	....	20.00	16.00	18.00	20.00	....	16.00	20.00	20.00	....	....	22.00	....	....	....	26.50	20.00
Building Sand		Cu. yd.	2.50	2.00	2.25	1.48	2.50	1.90	2.50	1.75	1.75	2.00	3.50	....	1.85	1.35	2.00	1.25	1.75	2.50
Crushed Stone	¾″	Ton	2.60	4.50	2.25	1.30	3.50	3.25	2.65	2.75	3.50	4.50	4.00	....	....	2.00	2.40	3.00	3.10	....
Wire Nails		Keg	5.05	....	4.25	4.25	....	3.80	3.80	4.10	4.50	4.25	5.35	4.85	4.35	4.35	3.75	6.25	4.50	4.00
Window Glass	Single A 10″x12″	50 sq. ft.	....	4.50	4.20	4.20	....	4.50	....	4.50	5.25	4.80	....	....	4.50	5.13	4.45	....	4.38	4.00
Hollow Tile	8″x12″x12″	Each	.23	.30	.21	.21	....	.17	.18	.21	.17	....	....	....	.20	.20	.17	....	.19	.19
Cast Iron Soil Pipe	4″ E.H. 13 lbs. per ft.	Ton	....	....	72.67	63.05	....	71.82	....	....	82.00	90.00	....	100.00	95.00	91.47	97.00	....	74.00	75.00
Steel Pipe	1″ galv.	100 ft.	....	....	10.52	10.00	....	10.36	....	10.50	12.00	11.25	....	13.14	14.20	12.78	10.50	14.50	12.35	10.40
Reinforcement Bars	¾″ square	100 lbs.	4.50	3.75	3.60	....	....	3.90	4.35	....	4.00	3.15	3.25	....	3.20	3.50	3.25	6.00	4.25	5.00
Structural Steel	Fab. 6″ I-beams	100 lbs.	5.00	5.25	4.50	3.65	....	3.50	4.10	4.50	4.95	5.00	3.65	....	5.75	6.00	....	....	6.95	....
White Lead	Dry	100 lbs.	....	....	12.60	14.00	14.00	12.00	12.50	14.00	14.50	14.50	15.50	13.00	11.75	13.25	....	15.25	13.00	13.90
Zinc Oxide	Am. process lead free	100 lbs.	....	....	....	....	....	....	....	15.00	19.00	14.75	....	....	19.00	....	....	....	17.00	....
Gypsum plaster	Neat	Ton	....	21.00	18.00	17.00	....	19.00	19.50	18.00	18.00	18.00	17.00	....	21.00	20.00	....	....	....	19.00
Linseed Oil	Raw in bbls.	Gal.	....	....	1.08	1.02	1.02	1.06	....	1.01	1.30	1.25	....	1.10	1.15	1.27	....	1.11	1.10	1.10
Roofing Slate	No. 1 ribbon	100 sq. ft.	....	....	15.00	....	....	13.50	....	15.00	18.00	18.00	....	....	....	23.00	16.50	....	....	14.00
Tar Paper, Roofing	2-ply 75 lbs. per roll of	100 sq. ft.	....	2.00	1.80	2.00	2.50	2.80	....	2.25	3.25	3.00	....	2.82	....	....	2.45	....	3.50	2.25
Rosin Sized Sheathing	3-ply 30 lbs. per roll of	500 sq. ft.	....	1.50	1.50	1.50	.90	.85	....	1.50	1.50	1.50	1.40	1.28	1.25	....	1.65	....	1.50	1.20

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A SURVEY OF IMPORTANT CURRENT ARTICLES ON BUILDING ECONOMICS AND BUSINESS CONDITIONS AFFECTING CONSTRUCTION

The Editors of this Department select from a wide range of publications matter of definite interest to Architects which would otherwise be available only through laborious effort

IMPORTANT DATA ON WINTER CONSTRUCTION

Facts and Figures Presented by Engineers and Contractors Prove That Big Savings Can Be Made on Jobs Carried on During Slack Months

ACCORDING to the New York *Times*, the movement to encourage winter building construction, not only as an economic proposition but as the best method of aiding the supply of housing to meet demand, was discussed from its various angles at two largely attended meetings of the New York Building Congress held early in December.

The consensus of opinion of engineers, contractors and builders who attended the meetings was that winter building cannot only be carried on successfully from November to March, but a very large saving can be made in the cost of labor and materials.

Facts and figures to prove the claim were presented by several of New York's largest construction firms.

At the first meeting ways and means were discussed, while at the second gathering figures on jobs completed where big savings had been made were presented, proving the case conclusively.

Harold M. Shreve, of Carrere & Hastings, outlined generally the reasons why winter building is sound from every economic viewpoint and presented a composite chart which graphically brought out the salient facts regarding the benefits of winter building. In explaining the chart, Mr. Shreve said:

"This chart shows applications, permits to build, in 20 cities, for the United States during the year 1922-23, plotted monthly, and shows that in the spring everybody gets busy and applies for permits to build. A little later in the year they don't want so many. Last year, after they had made a splurge in March and the situation with which we are all familiar had developed, they made very much less of a fuss in April than they did in March about going ahead. There is your spring slump of last year.

"The contracts awarded in 27 states are also shown by months. The New York Building Department for the last ten years shows when people make their alterations in New York, and we have made up a composite curve showing when alterations are made in New York, this being the result of an average of ten years.

"Those are some of the things I would say can be remedied," said Mr. Shreve.

"The figures have no relation one to another, so far as totals go. They only show tendencies. It looks as if somebody was getting busy this fall to do some work this winter.

"It is not only ahead of us for this winter, but it has been done during the winters that are passed, and I am going to put my little testimonial in on the side of one where we have actually effected a program and are now under way."

"There was a saving of $87,710 on this job, the building work of which cost $750,000," said John Lowry, Jr., showing a picture of a well known New York apartment house, built by his company during the winter of 1922-23.

"To offset that, the expenditures for winter construction were a total of $3,863 or about one-half of 1 per cent of the total cost of the job. This extra cost was for the protection of workers and materials and supplying the necessary heat.

"If you consider the bricklayer production in the summer of 1922—100 per cent—in the erection of this job during the winter of 1922-23, the bricklayer production was 109 per cent, or 9 per cent more than the summer of 1922.

"Comparing this with 1923, this last summer, the bricklayer production was 91 per cent. In other words, on this job, carried on during the winter, I produced 18½ per cent more brick per day per man than I was able to do this last summer on brickwork.

"Bricklayers working on the job got $10 a day. The payroll for the entire job was $28,150 for bricklayers.

"If it had been continued this last summer of 1923, the dropping off in production, or in efficiency, if you so choose to call it, would have added $5,630 to the cost of bricklaying alone. If you consider the bonus award of $4, that is, $14 per man today, the bonus would have cost $11,260 more. In other words, the brickwork on this job would have cost $16,890 in addition to the $28,150 as actually paid for bricklayers.

"The payroll on this job for bricklayers, carpenters, labor and engineers amounted to $130,667. If it had been done last summer, rather than the last winter, the dropping off in production and the bonus award would have added $25,680 to the cost.

"In addition to the saving in labor, the saving on purchases of materials in sub-contracts on this job amounted to $16,030 over the prices I was able to procure in the summer of 1922. In other words, between labor and the purchase of materials and subcontracts there was a saving of $87,710 on this job, the building work of which had cost $750,000.

"To offset that, the expenditures for winter construction were as follows: Temporary protection to labor and material, $871; tarpaulins cost $667, with a salvage of $442, net cost $225; temporary heat, salamanders, cost $668; salamanders, $302; coke, $302; boiler attendants, labor, $1,036; coal for boiler heating, $150; temporary lighting, labor and service, $196; snow clearing, $111; a total of $3,863, or about one-half of 1 per cent of the total cost of the job.

"Bear in mind that the labor saving was $25,680 and the material and subcontract saving was $62,000 to offset $3,863 winter protection cost.

"Charles M. Schwab realized the value of winter construction. As a matter of fact, some time ago he gave me an order to build half a million dollars' worth of buildings.

"They could be built next summer just as well as this winter. He required that they be finished on Sept. 1, 1924. The work is in course of construction now. I have some of it enclosed and some of it in the open. I will keep my gang steadily employed the winter through, in bad days working inside and on good days on the outside. Through this means I will save many thousands of dollars in the course of construction.

"Build in winter and keep the architect, builder and subcontractor and labor busy. It will better balance up the industry."

That working with concrete during the cold season is practical from every standpoint was explained by W. J. Barney, President of the Barney-Ahlers Construction Company. He placed himself on record that "more winter construction is the

acknowledged remedy for seasonal unemployment in the building industry."

"You have been told forcibly of the social and economic evil of seasonal unemployment for the carpenters, the bricklayers, in fact, for all those who directly do the work of our industry," said Mr. Barney, "and to many this problem of seasonal employment seems to be solely a picture of its hardship to the mechanics and workers in the various trades.

"This is but the sharp foreground of the picture; its larger background shows that where the mechanic is unemployed also are unemployed the contractor, material manufacturer, the architect and all others involved in our great industry—we one and all suffer from this curse of seasonal variation in the volume of our business, and finally in the horizon you see the public paying during the period of intense activity higher wages, higher prices and larger fees to compensate for the period of enforced idleness, during which the mechanic must live on his earnings' savings, the contractor carry his overhead, the architect maintain his staff and the material manufacturer offset his plant investment and factory overhead.

"In short, this is not a problem whose solution will be beneficial to mechanics alone, but is one in which all sections of this Building Congress are vitally interested, and to which they could all well afford to contribute liberally for its solution through the more even distribution of construction throughout the entire year.

"I have had our estimating department take from their files typical estimates, and using these various factors, the same building would have been estimated by us in August at $208,000 and estimated by us today for winter construction at $203,000, showing a saving to the owner of at least $5,000, or 5 per cent, this including all cost of winter protection. Therefore, under present labor and material conditions, it is certainly conservative to say that winter construction costs no more than summer work."

FORECAST OF SPRING BUILDING CONDITIONS

ACCORDING to *The Constructor*, "conditions affecting construction activities next spring will be closely similar in character to those which prevailed at the opening of the eccentric building season of 1923, following indications drawn from statements of leading general contractors and other observers of the trend of operations. With these statements, made exclusively for *The Constructor* the publications of the Associated General Contractors of America, stripped of localism, also seem to agree, in the thought that owners and others will do well to use caution next year in timing their operations, lest a 'mad market' for labor and materials, such as threatened early this year be encountered and the entire situation demoralized.

"The belief in some quarters, as expressed in the statements published in the current issue of *The Constructor*, also seems to be that an unusual amount of work is to be undertaken for completion during the first months of 1924. In some sections of the country, where the deficiency in buildings is especially noted, leaders are advocating that winter construction be urged, with a softening of prices of materials and of wages being held as inducement for this step to be taken to avert an extraordinary demand during the months when construction ordinarily is placed under way.

"Many of these individual statements deal directly with the question of whether curtailment of operations, such as was advocated and initiated by the Associated General Contractors of America last spring, be held as policy next year to avoid runaway prices of materials and costs of labor, or whether a relaxation, perhaps entire absence of action, will be more advisable."

Quotations from a number of the statements appearing in *The Constructor* follow:

James Baird, George A. Fuller Co., New York—"Judging from the permit record covering the period of June, July and August, there is assurance the country in general having a large building program for this coming year; consequently, I look for a very serious labor shortage again in the spring. There is so much speculative work contemplated that I do not think it would be desirable to encourage it too much. Personally, I would prefer to see a reasonable amount of the work postponed until we are assured of a more ample supply of labor and material."

H. W. Baum, H. W. Baum Company, Salt Lake City—"It is our opinion that there is not likely to be a situation during the coming year which will require curtailment in any substantial form in the construction activities of the inter-mountain district."

L. C. Wason, Aberthaw Company, Boston—"My forecast for the future is that there will be slight reduction in building costs through the winter, due to softer spots in the material markets and increased labor efficiency, but that the usual spring building activity will bring costs back to about the present level. Therefore, a 'Build Now' campaign for fall and winter is in the line for stabilizing the industry and giving the investors a square deal."

Sumner Sollitt, Sumner Sollitt Company, Chicago—"Men available for construction are not now plentiful. I thoroughly believe that no propaganda at the present time, either for obstructing or accelerating the desire for contemplated construction, is necessary. Moderate price residential work will go ahead in volume just as soon as owners are sure they can obtain value received. Building construction on railroads is becoming more active and certainly much is contemplated. Manufacturers seem to have had a good year and expansion seems to be still their desire."

W. F. Austin, W. E. Wood Company, Detroit—"It would seem to us, from our very limited knowledge of the situation, that the safest plan would be to advocate that for the next six months, at least, the building construction be confined to those structures most urgently necessary. Doing this not with the idea that costs may be lowered after that period, but with the thought that unless something of this kind is done costs will again reach the point where a general let-up and universal discontinuation of construction operations will be the result."

A. S. Downey, A. W. Quist Company, Seattle—"Taking everything into consideration, it would seem a wise policy at this time to encourage building construction so that we may gradually bring our building program to meet the present demands."

Henry Ericsson, Henry Ericsson Company, Chicago—"The after-effect of the war had a very peculiar influence on things in general. It seems to me that everybody is having more money and lives on a higher plane than before the war; this creates a demand for more new buildings than were required before the war. That is one of the reasons for the building rush in the past and it may be the reason for its continuance for another year or two."

S. B. Haux, The American Construction Co., Houston—"It is my observation in this locality that further curtailment of building operations is essential to the good of the cause, due to the unprecedented demand of labor."

Otto M. Eidlitz, Mark Eidlitz & Son, New York—"I believe that wages are probably fixed for the next two years, and that the price of building materials will vary somewhat during the winter months. The work that would normally come out to meet the still unsatisfied demand for housing and additional business accommodations, as well as the starting up of the work that has been held up during this year, will make 1924 a big year in the building industry."

T. T. Flagler, The Flagler Company, Atlanta—"This is a very general view. In particular we are interested in construction only in the South and throughout this territory it is my opinion that further building under present conditions will be profitable to the owners in something like

90 per cent of the territory we cover, and this is the real criterion which should cover the volume of construction."

Archibald M. Woodruff, Third Vice-president, Prudential Insurance Company—"At the present time we are having a very large demand for mortgage loans to be secured by complete structures, and we have recently declined a number of applications for construction loans. From the information we have received, it is my opinion that there will be an excessive demand for labor in connection with building construction work for several months at least, particularly in our larger cities."

H. C. Turner, Turner Construction Company, New York—"As to business conditions in the future, most of the factors seem favorable for good business, but we have had a bad wheat situation, a disorganizing oil industry and uncertain legislative prospects. Having in mind the great volume of work offered this past eight months, only a part of which could be built, it would seem foolish if the country did not give full employment to all competent workmen during the coming winter and year 1924."

The President of a Leading Engineering Society—"I am glad that the construction program was curtailed some few months ago, and while I think that at this season it is not likely to run away, yet I believe that caution is necessary lest the program for the next year be made too ambitious and we start out at the beginning of the 1924 construction season with a bigger program than can be put over, with the consequent result that the precedents will be artificially boosted."

The Comptroller of a Leading Life Insurance Company—"As to the trend of construction activities, I do not see any likelihood that they will be diminished. I think the country is still behind in its construction program as to buildings used for residence purposes and business buildings. I have no information on factories, as we do not lend on factory properties, but I think it is likely that it will be some time before the building program has reached the saturation point."

H. N. Leighton, H. N. Leighton Company, Minneapolis—"As to the advisability of relaxing the curtailment of building operations advocated earlier in the year, it is our judgment that this should be done. This statement is based on the impression which has come to us especially during the past six months, during which time there has been a very pronounced decrease in the amount of work offered for figures, and if anything can be done to counteract this tendency it would seem to be highly advisable."

L. J. Horowitz, Thompson-Starrett Co., New York—"I am of the opinion that conditions have been considerably improved but that the time has not yet arrived when it can be said that the industry has been stabilized to a sufficient extent to make it prudent for an owner to embark upon a building operation to which he is not committed. There will, of course, be exceptions to this rule. There are some situations which will warrant an owner in proceeding notwithstanding high costs, because his needs for space are so great as to overshadow the disadvantage of high costs."

BIGGEST REAL ESTATE BOOM IS INDICATED IN NATIONAL SURVEY

Activity in Nine Months Just Closed Is Greatest in the History of the Country—Approaching Stabilization

THAT the most active period in American real estate history was that comprised in the last nine months is the conclusion reached in a survey just issued by the National Association of Real Estate Boards. According to the report, rent costs and building supply are nationally approaching stabilization, says the New York *World*, and the greatest construction need is small houses for single families.

The American real estate market, called in the survey a conservative index of American business conditions, has been more active during the season just coming to a close than during any other season in the business history of the continent, Canada being included in the estimate.

Findings of the survey, constituting a careful barometric reading for a basic section of American business activity, are based on reports of constituent real estate boards in 240 cities.

Approaching stabilization of several of the factors that underlie the present unprecedented national real estate activity is indicated, the survey finds. While it is impossible to predict with certainty the course the market will take in 1924, the situation at present seems to point to a continuation of activity, and there are some indications that 1924 will surpass the present banner year, the summary states.

Indications found of interest to renters, property owners, investors, builders and to students of the general business trend are as follows:

More transfers of real property were recorded and more buildings were erected during the first nine months of 1923 than during the same period of any year in the history of the American continent.

Rents have increased largely the country over, both for business and for residential property, but in general they are becoming stabilized at the present levels. Residential rentals show the stabilizing tendency more strongly than business rentals. The situation is more favorable toward stabilization in cities of over 200,000 population, 72 per cent of which report residential rents stationary.

Rents are following the course of the cost of building. While according to the most authentic index of living costs rents are now 25 points higher than other commodities, present rents are low compared with the cost of construction. Before rents decrease perceptibly there must be a decrease in the cost of building.

Great inroads are being made in the national building shortage, which was so pronounced after the war. Shortage is most acute apparently in the East and Far West. There is prevalent throughout the reports the impression that the supply of housing accommodations and business structures is about to reach a state of equilibrium between supply and demand.

The greatest demand at the present time in the real estate market is for small single-family dwellings. Sixty-eight per cent of the cities reporting indicate a shortage here, whereas only 54 per cent report a shortage in apartment houses. Only 43 per cent report a shortage in business structures.

Amount and value of building construction have been extraordinary, making it safe to assume that the increase of 23 per cent over the record year 1922, maintained, according to the United States Bureau of Labor statistics, for the first six months of 1923, will be fairly well maintained for the whole year if not made still greater, despite the failure to top last year's June building crest.

Of 236 cities answering, 223 state that with all the tremendous construction there is no overbuilding of any kind.

The surburban movement in the larger cities, pronounced tendency of present-day city growth, is, generally speaking, greater than last year, and is likely to be continued.

Money for investment in real estate is comparatively plentiful. Interest rates are reasonable in nearly every section.

The market for business property is reported better than last year by 57 per cent of the real estate boards contributing to the survey. The market for residential property is reported better than last year by 55 per cent of the boards.

Los Angeles tops the principal cities of the country in gains shown over last year in real estate transfers and conveyances, with an increase for the first nine months of 46 per cent, but survey of 19 principal cities indicates that the national high water mark of 1922 has been surpassed this year by an average of 30 per cent. In only one city reporting is there a decrease shown in the number of

transfers recorded. This is Fargo, N. D. North Dakota is suffering from the low price of wheat and the adverse conditions surrounding agricultural production.

Building shortage of some kind is reported by practically all the large cities of the East. However, of 23 cities of over 200,000 population 20 report that they have caught up with their building program and may be considered normal. Business structures have made the most rapid adjustment.

The labor situation in the building trades is reported encouraging. Labor supply is stated to be sufficient in 49 per cent of the cities, and 76 per cent report the situation the same or better than last year. In nearly 50 per cent of the cities wages are reported higher, but bonuses paid in the summer rush season are disappearing. Increases in numbers of apprentices in some trades point to relief.

While there is at present an inclination for prices of building materials to decline, the survey finds no reason to suspect that the price will decrease perceptibly. And so long as the cost of labor remains at its present level it is doubtful whether the nation can experience any decrease in the cost of housing accommodations.

Acceleration of the movement toward subdivisions, result of the crowding and constant growth of larger cities, is reported by 70 per cent of the cities answering the questionnaire. While the movement may not increase particularly in the future, it may be expected to maintain a constant level.

BUILDING TRADE WAGES IN NEW YORK TO STAY AT 1923 LEVELS

THE Building Trades Employers' Association announced recently a decision to maintain through 1924 the same wage scale and bonus paid building trades unionists throughout 1923. The employers reported that a survey of the situation demonstrated that higher wages would impede and perhaps halt construction now needed badly.

The willingness of the association to hold to the "peak" wages now being paid was disclosed by Christian Norman, Chairman of the Board of Governors, who said that inquiry among speculative builders and investors revealed that their boom plans for the forthcoming year were predicated on the assumption that wages could not go higher.

A short time ago the old Building Trades Council made a request to the employers to continue the 1923 wage and bonus through 1924, but to add $1 to the daily pay. According to statisticians employed by the Building Trades Employers' Association this extra $1 a day would add from $10,000,000 to $25,000,000 to the cost to owners and contractors.

Wage Increases in Nine Years

The employers' table, showing increases in the last nine years, follows:

Classification of worker	Daily wage, 1914.	1923.	Pc. inc.
Glaziers	$3.14	$10.00	218.5
Electrical workers' helpers	2.20	6.50	195.4
Cement masons' laborers	2.62	7.50	186.2
Houseshorers	3.68	10.00	171.7
Bricklayers' laborers	3.00	8.00	166.6
Steamfitters' helpers	3.00	8.00	166.6
Asbestos workers' helpers	3.00	8.00	166,6
Plasterers' laborers	3.25	8.50	161.5
Composition roofers	3.50	9.00	157.1
Stone bedrubbers, large side	3.50	9.00	157.1
Carpenters (Richmond)	4.00	10.00	150.
Stone masons	4.80	12.00	150.
Painters and decorators	4.00	10.00	150.
Stone handrubbers, etc	2.75	6.80	147.2
Mosaic helpers	3.25	8.00	146.1
Derrickmen and riggers	4.00	9.50	137.5
Stone, crane operators, etc	3.00	7.10	136.6
Art glass workers	3.82	9.00	135.6
Elevator constructors' hlprs	3.40	8.00	135.3
Tile layers' helpers	3.00	7.00	133.3
Marble workers' helpers	3.50	8.00	128.5
Housesmith finishers' hlprs	3.50	8.00	128.5
Stone bedrubbers, rear side	3.50	8.00	128.5
Carpenters (Bronx, Brooklyn, Queens)	4.50	10.00	122.2
Mosaic workers	4.50	10.00	122.2
Roofers, slate	5.50	12.00	118.1
Plasterers	5.50	12.00	118.1
Marble polishers	4.40	9.50	115.9
Stone sawyers	3.50	7.45	112.8
Asbestos workers	4.75	10.00	110.5
Electrical workers	4.80	10.00	108.3
Marble sawyers	4.68	9.50	102.9
Housesmiths, structural	5.00	10.00	100.
Housesmiths, finishers	5.00	10.00	100.
Cement masons	5.00	10.00	100.
Carpenters (Manhattan)	5.00	10.00	100.
Metallic lathers	5.00	10.00	100.
Sheet metal workers	5.00	10.00	100.
Engineers, hoisting	6.00	12.00	100.
Bricklayers	6.00	12.00	100.
Stone setters	6.00	12.00	100.
Marble carvers	6.00	12.00	100.
Stone planermen	4.25	8.35	96.4
Marble bedrubbers	4.95	9.50	91.9
Marble cutters and setters	5.50	10.50	90.9
Elevator constructors	5.28	10.00	89.3
Plumbers	5.50	10.00	81.8
Steamfitters	5.50	10.00	81.8
Stone cutters	5.50	10.00	81.8
Tile layers	5.50	10.00	81.8

Little Prospect of Strike

Likelihood that a strike would result from the decision of the employers to maintain the present rate of pay seems to be decidedly remote. It was pointed out that both employer and union were bound by a pledge to submit all controversies to arbitration. A clause provides that work shall be continued pending negotiations and if the arbiters report favorably on the union's claims, the allowed advance is made retroactive.

PRACTICABILITY OF EIGHT-HOUR DAY IN STEEL INDUSTRY

IN reference to the question recently raised as to the practicability of the 8-hour day in the steel industry of the United States, the Federal Council of the Churches of Christ in America has obtained permission from Raymond B. Fosdick to reprint the following letter received by Mr. Fosdick from J. F. Welborn, President of the Colorado Fuel and Iron Company. Mr. Fosdick is a member of the Board of the Colorado Fuel and Iron Company, representing the interests of John D. Rockefeller, Junior, on that Board.

"The change, as you know, was made November 1, 1918, the hourly, tonnage and piece rates being increased 10 per cent when the working shift was reduced from 12 to 8 hours. Our rates, prior to November 1, 1918, had always been on the same basis as the steel industry generally paid in the East.

"The changes, both in working hours and basic rates, were arranged at conferences between officials of the company and representatives of the employes and followed numerous requests, made by employes, after the adoption of our Employes' Representation Plan early in 1916, that the 12-hour work shift be eliminated.

"The immediate results, from the standpoint of production per man hour, and of labor cost per unit of output, were satisfactory, and where conditions have been comparable, it has been evident that we have lost nothing either in producing cost or output by reason of the change.

"At blast furnaces the labor cost per ton, immediately following the introduction of the 8-hour day with the increase of 10 per cent in wage rates, increased slightly over 1 per cent above former costs. At open hearth furnaces it increased 1½ per cent, while at our rolling mills there was a substantial reduction in the labor cost per ton.

"Recent careful analyses of operating results between various 12- and 8-hour work periods have been made and show these results to be even more satisfactory than we had realized before. The trends of production per man hour, with unimportant exceptions, have been upward since the adoption of the 8-hour day; and in every department of our steel manufacturing operations, from blast furnace to the wire mill, our production per man hour is now greater than it was when all of these activities were operating on the 12-hour shift. Comparing these results of the last few months with periods of similar production when basic rates were 10 per cent lower than current rates and the working time 12 hours per day, we find that almost without exception our labor cost per ton is lower than in the earlier periods.

"Furthermore, whenever the question of change made in the length of the working day has come up for discussion between officials and employes' representatives, satisfaction with the change has been expressed by the employes. It is obvious, therefore, that our change from a 12-hour to an 8-hour day was practical and has been successful.

"A factor of added interest is the fact that, with almost capacity operations at our steel plant during the last few months and employing over 6,000 men, we have experienced no shortage of labor. Our operating officials have frequently expressed the belief that this condition is due, in large part at least, to adoption of the 8-hour shift."

Selected List of Manufacturers' Literature

FOR THE SERVICE OF ARCHITECTS, ENGINEERS, DECORATORS, AND CONTRACTORS

The publications listed in these columns are the most important of those issued by leading manufacturers identified with the building industry. They may be had without charge, unless otherwise noted, by applying on your business stationery to *The Architectural Forum*, 383 Madison Ave., New York, or the manufacturer direct, in which case kindly mention this publication.

ACOUSTICS

Johns-Manville, Inc., Madison Ave. & 41st St., New York, N. Y.

Architectural Acoustics. Booklet. 6 x 9 in. 24 pp. Illustrated. Treatise on the correction of architectural acoustics in churches, schools, hospitals, office buildings and other places.

ASH HOISTS—ELECTRIC AND HAND POWER

Gillis & Geoghegan, 544 West Broadway, New York, N. Y.

General Catalog. 8½ x 11 in. 20 pp. Fully illustrated. Contains specifications in two forms (with manufacturer's name and without). Detail ¼" scale for each telescopic model and special material-handling section.

The Man-Saving Load Lifter, 5⅞ x 8⅞ in. 8 pp. Illustrated. Describes G&G Telescopic and Non-Telescopic Hoists for handling material in factories.

BATHROOM ACCESSORIES

The Fairfacts Company, 234 West 14th St., New York, N. Y.

Catalog F. 4 x 9 in. 12 pp. Illustrated. Describes full line of china fittings for bathrooms.

The Perfect Bathroom. Booklet. 4 x 9 in. 12 pp. Illustrated. Shows full line, Biltin and Projecting Types, installed. For architects and clients.

BOILERS—See Heating Equipment

BRICK

American Face Brick Association, 1751 Peoples Life Bldg., Chicago, Ill.

The story of Brick. Third Edition. Booklet. 7 x 9¼ in. 55 pp. Illustrated. Presents the merits of face-brick from structural and artistic standpoints. Tables of comparative costs.

The Home of Beauty. Fourth Edition. Book. 8 x 10 in. 72 pp. Color plates. Presents fifty designs for small face-brick houses submitted in national competition by architects. Text by Aymar Embury II, Architect. Price 50c.

Bungalow and small house plans. Booklets. 8½ x 11 in. 50 pp. Illustrated. Four booklets, showing a variety of designs for small face-brick houses, covering 3, 4, 5, 6, 7 and 8 room houses. Price, 25c. each, $1 for the set.

A Manual of Face-Brick Construction. Booklet. 8½ x 11 in. Text-book on construction of the brick wall and various uses of face brick. 31 colored plates of brick houses with plans. Price, $1.00.

Architectural Details in Brickwork. Series 1, 2, 3. 8½ x 11 in. Very useful to the architect or draftsman. Sent free to architects applying on their office stationery. To others $1.50.

B. Miffin Hood Brick Co., Atlanta, Ga.

Burned Clay Products. Booklet. 9½ x 12½ in. 47 pp. Illustrated. Shows different uses of brick, but presents particularly the various uses of quarrie floor tile. Free to architects and engineers.

BUILDING FINANCE

S. W. Straus & Co., 565 Fifth Ave., New York, N. Y.

The Straus Plan of Financing. Booklet. 8 x 6 in. 24 pp. Illustrated. Describes Straus system of co-operating with Architects, Builders, Engineers and Brokers in financing important building operations; also the making of construction loans on larger and better properties in our large cities.

Forty-one Years Without Loss to Any Investor. Booklet. 8 x 5 in. 38 pp. Illustrated. A carefully prepared booklet for the thinking investor. Describes Straus bonds, the property upon which loans are made, and explains the Straus plan of safeguards which made possible the 41-year record.

BUILDING STONE—See Stone, Building

BUILDING, STANDARD STEEL

Truscon Steel Company, 250 W. Lafayette Blvd., Detroit, Mich.

Truscon Standard Building Catalog. 8½ x 11 in. 48 pp. Contains data and illustrations.

BUILDING, STEEL PRODUCTS FOR

Truscon Steel Company, 250 W. Lafayette Blvd., Detroit, Mich.

Truscon Data Book. Catalog. 3½ x 6 in. 128 pp. Illustrated. Contains complete information with illustrations on Truscon reinforcing steel, steel windows, metal lath, standard buildings, concrete inserts, steel joists, pressed steel stamping and chemical products.

CEMENT

Carney Company, The, Mankato, Minn. Booklet. 8 x 10 in. 24 pp. Illustrated. Complete information on product, showing prominent buildings in which this cement has been used.

Louisville Cement Co., 315 Guthrie St., Louisville, Ky.

Brixment. Booklet. 7½ x 5 in. 16 pp. Illustrated. Brixment, what it is, what it does, how it does it and why.

Sandusky Cement Co., Dept. F, Cleveland, Ohio.

Medusa Waterproof White Portland Cement. Booklet. 8½ x 11 in. 32 pp. Illustrated.

Medusa Integral Waterproofing Powder and Paste. Booklet. 8½ x 11 in. 88 pp. and cover.

CONDUIT

National Metal Molding Co., 1113 Fulton Building, Pittsburgh, Pa.

Bulletin of all National Metal Molding Products. In correspondence folder. 9½ x 11½ in.

Sheraduct. Circular. 5 x 8 in. Illustrated.

Flexsteel. Circular. 5 x 8 in. Illustrated.

CONSTRUCTION, FIREPROOF

Massillon Steel Joist Co., Massillon, Ohio.

Massillon Bar Joists. Brochure. 8½ x 11 in. Illustrated. Full data regarding the steel used for constructure of floors in fireproof buildings of various kinds.

National Fire Proofing Co., 250 Federal St., Pittsburgh, Pa.

Standard Fire Proofing Bulletin 171. 8½ x 11 in. 32 pp. Illustrated. A treatise on fire proof floor construction.

CONSTRUCTION, FIREPROOF—Continued

Northwestern Expanded Metal Co., 934 Old Colony Building, Chicago, Ill.

Fireproof Construction Catalog, 6 x 9 in. 72 pp. Illustrated. Handbook of practical suggestions for architects and contractors. Describing Nemeo Expanded Metal Lath.

Fireproof Construction. Catalog. 6 x 9 in. 72 pp. Illustrated. Describing Kno-Burn expanded metal lath.

DAMPPROOFING

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York.

Specification Sheet. 8½ x 11 in. Descriptions and specifications of compounds for dampproofing interior and exterior surfaces.

DECORATIVE TILES

The Rookwood Pottery Company, Cincinnati, Ohio.

Halftone reproductions and photographic prints showing various tile treatments. 9½ x 11½ in.

DOORS AND TRIM, METAL

The American Brass Company, Waterbury, Conn.

Illustrated pamphlet describing use and adaptability of Extruded Architectural Bronze Shapes for metal window frames, doors, grilles, counter screens, etc.

The Compound & Pyrono Door Company, St. Joseph, Mich.

Pyrono Handbook for Architects and Contractors. 8½ x 11 in. 16 pp. Contains full information regarding Pyrono Fireproof Veneered Doors and Trim, with complete details and specifications.

Pyrono details in sheet form for tracing.

Dahlstrom Metallic Door Company, 425 Buffalo Street, Jamestown, N. Y.

Architectural Catalog. 10 x 14 in. 46 pp. 11 sections. Illustrated. Catalog showing our regular styles and types of hollow metal doors and interior trim. Various types of frames and other architectural shapes also illustrated.

Richards-Wilcox Mfg. Co., Aurora, Ill.

Fire Doors and Hardware. Booklet. 8½ x 11 in. 64 pp. Illustrated. Describes entire line of tin-clad and corrugated fire-doors, complete with automatic closers, track hangers and all the latest equipment—all approved and labeled by Underwriters' Laboratories.

The J. G. Wilson Corporation, 11 East 36th St., New York, N. Y.

Rolling Doors and Shutters. Book. 8½ x 11 in. 72 pages. Illustrated. Contains specifications, details, dimensions and photographs.

Doors for Industrial Buildings. Booklet. 8½ x 11 in. 16 pp. Illustrated. Data covering different types of doors made for industrial structures.

DRAFTING MATERIALS

American Lead Pencil Company, 220 Fifth Ave., New York, N. Y.

VENUS Pencil in Mechanical Drafting. Booklet C20. 6 x 9 in. 16 pp. Illustrated. Describes the many possibilities of the VENUS for technical drawing.

Catalog. 3¾ x 8¾ in. 25 pp. Illustrated. Describes pencils, holders, erasers, etc.

DUMBWAITERS

Kaestner & Hecht Co., Chicago, Ill.

Bulletin 520. Describes K. & H. Co. electric dumbwaiters. 8 pp.

Sedgwick Machine Works, 151 West 15th Street, New York.

Catalog and Service Sheets. Standard specifications, plans and prices for various types, etc. 4¼ x 8¼ in. 60 pp. Illustrated.

ELECTRICAL EQUIPMENT

The Arrow Electric Company, Hartford, Connecticut.

Catalog of Complete Wiring Devices. 7½ x 10 in. 160 pages. Illustrated. Also small pocket edition.

Manual of Electrical Wiring Devices for Use in Limited Space. This manual will be very useful in the installation of receptacles and switches in shallow partitions as it gives specifications for such work.

Specification sheets for Arrow flush tumbler switches, shallow flush push button switches and double T slot flush receptacles.

Connecticut Electric Mfg. Co., Bridgeport, Conn.

Up-to-date Electrical Specialties Pocket Catalog. 3 x 4¾ in. 305 pp. Illustrated. Gives size, weight, prices and data for sockets, receptacles, rosettes, switches, cut-outs and other wiring devices.

Connecticut Toggles Switches Folder. 3½ x 6½ in. 4 pp. Illustrated. Describes latest idea in electric switch and gives list price, catalog numbers and schedules.

Connecticut Sockets. Folder. 3½ x 6½ in. 6 pp. Illustrated. Describes Key-Keyless and Push Button Sockets and gives prices and catalog numbers.

Frink, Inc., I. P., 24th Street and 10th Avenue, New York, N. Y.

Catalog 415. 8½ x 11 in. 46 pp. Photographs and scaled cross-sections. Specialized bank lighting, screen and partition reflectors, double and single desk reflectors and Polaralite Signs.

General Electric Company, Schenectady, N. Y.

Wires and Cables. Booklet. 8 x 10½ in. 85 pp. Illustrated. Four Bulletins in a binder, describing wires and cables in general, conductor insulated with vulcanized rubber compound, varnished cambre and paper insulated cables, splicing materials and junction boxes for cable installations, armored cables.

Electric Fans. Folder. 6 pp. 3¼ x 6 in. Illustrated. Describes 1922 line of electric fans, giving catalog numbers, voltages and frequencies.

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 89*

ELECTRICAL EQUIPMENT—Continued

Reliable Wiring Devices. Catalog. 3 x 4⅝ in. 206 pp. Illustrated. Pocket catalog giving prices, schedule classifications and data for socket receptacles, switches, rosettes, cutouts and fuses for miscellaneous devices.

Lighting of Public Buildings. Bulletin. 6 x 9 in. 25 pp. Illustrated. Describes lighting of galleries, banks, museums, libraries, municipal, county and state buildings.

The Edwin F. Guth Co., 2615 Washington Ave., St. Louis, Mo.

Bracolite Catalog No. 10, 10½ x 8 in. 28 pages. Illustrated. Catalog listing Brascolite fixtures in wide variety of plain and decorative types. Contains information of value in planning a lighting installation.

Bank and Office Building Catalog, 10½ x 8 in. 16 pages. Illustrated. Catalog listing a selected line of fixture equipment for application to all outlets in bank or office building or similar buildings.

Architectural Bulletins, Series of 5. 10½ x 8 in. 28-64-44-28-44 pages. Illustrated. A series of five bulletins, each treating upon the application of lighting to one particular class of service. Hospitals; Banks and Office Buildings; Schools, Colleges and Y. M. C. A. Buildings; Church and Fraternal Buildings; Commercial Service.

Special Hospital Catalog. 10½ x 8 in. 9 pages. Illustrated. Illustrates a special selection of fixture equipment for hospital use including types suitable for all outlets.

Hart & Hegeman Mfg. Co., 342 Capitol Ave., Hartford, Conn.

A new H & H Switch. Leaflet. 3½ x 6 in. 4 pp. Illustrated. Illustrates a new H & H composition base push switch of De Luxe quality.

Tumbler Switches. Booklet. 3½ x 6 in. 6 pp. Illustrated. Shows complete line of H & H Tumbler Switches.

H & H Elexits. Booklet. 8 x 10¼ in. Illustrated. Shows new complete line of Elexits—places for lights. May be used for Wall Receptacles or Electric Fixtures.

H & H Radio Button Push Switches. Booklet. 3½ x 6 in. Illustrated. Radio Luminous Buttons applied to Push Switches and Sockets.

The Holtzer-Cabot Electric Co., Amory St., Boston 19, Mass.

Signaling Systems for Hospitals. Brochure. 8½ x 11 in. 42 pp. Illustrated. Contains complete data covering Nurse's Call, Doctor's Call, "In" and "Out," Fire Alarm, Watchman's Clock and Telephone Systems.

Signaling Systems for Schools. Brochure. 8½ x 11 in. 47 pp. Illustrated. Contains complete data covering Telephone Systems, Program Bells, Fire-Alarm Systems, Low Tension Power Plant and Laboratory Equipment.

Kohler Co., Kohler, Wis.

Kohler Automatic Power and Light 110 Volt D. C. Booklet. 5 x 7 in. 32 pp. Illustrated. Describes a standard voltage automatic, electric power and light plant for isolated homes.

Simplex Wire & Cable Co., 201 Devonshire Street, Boston, Mass.

Simplex Manual Catalog and reference book. 6¾ x 4¼ in. 92 pp. Contains in addition to information regarding Simplex products, tables and data for the ready reference of architects, electrical engineers and contractors.

Specification No. 2053. For Simcore Wires and Cables. Various sizes of Conductor-Rubber Insulation.

Standard Electric Time Co., Springfield, Mass.

Catalog of Standard Electric Time Systems. No. 35. 8¾ x 6 in. 58 pp. Illustrated. Shows all types of Standard Electric Time Devices, with full information about mechanism, construction, design and installation.

School Booklet. 8⅛ x 11 in. 8 pp. Illustrated. Describes completely the use of Standard Electric Time, Program and Signal Systems in schools. References included.

Industrial Booklet. 8⅛ x 11 in. 12 pp. Illustrated. Describes use of Standard Electric equipment in industrial establishments, with references.

Data Folder for Architects. 8½ x 11 in. Illustrated. Looseleaf folder, to be added to from time to time, giving specifications and wiring diagrams and other useful data.

Varnum Door Engine Company, 949 West 16th St., Los Angeles, Calif.

Varnum Electric Door Engines. Booklet. 5 x 7¾ in. 16 pp. Illustrated. Descriptive booklet containing illustrations and list of representative institutions now using Varnum Door Engines.

Western Electric Co., 195 Broadway, New York, N. Y.

Western Electric Inter-Phones for Apartment Houses. Booklet. 5¼ x 6¾ in. 16 pp. Illustrated. Illustrates and describes use of Inter-Phones in Apartment Houses.

Installing and Maintaining Western Electric Inter-Phones in addition to giving general information on layout of systems; details are supplied on individual Inter-Phone Systems, listing battery and wiring requirements.

Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa.

Safety Switches. Folder F-4434 B. 3½ x 6 in. 2 pp. The 100 per cent Safe Service Entrance Switch.

Meter Service Switches. Booklet. F-4484. 3½ x 6 in. 16 pp.

Panel Boards. Catalog 22A. 8½ x 11 in. 16 pp. Illustrated.

What Fans Are For. Booklet F-4520. 3½ x 6 in. 16 pp. Illustrated in color.

ELEVATORS

Kaestner & Hecht Co., Chicago, Ill.

Bulletin 500. Contains 32 pp. Giving general information on passenger elevators for high buildings.

Bulletin 530. Interlocks for Passenger and Freight Elevators.

Bulletin. Signals for Passenger and Freight Elevators.

Otis Elevator Company, 11th Ave. & 26th Street, New York, N. Y.

Otis Push Button Controlled Elevators. Booklet. 6 x 9 in. 56 pp. Illustrated. Detailed description of Otis Push Button Elevators. Their uses in residences, stores, institutions, apartment houses, business offices and banks, etc.

Otis Geared and Gearless Traction Elevators of All Types. Descriptive leaflets. 8½ x 11 in. Illustrated. Full details of machines, motors and controllers for these types.

ELEVATORS—Continued

Escalators. Booklet. 8½ x 11 in. 22 pp. Illustrated. Describes use of escalators in subways, department stores, theatres and industrial buildings. Also included elevators and dock elevators.

Richards-Wilcox Mfg. Co., Aurora, Ill.

Elevators. Booklet. 8½ x 11 in. 24 pp. Illustrated. Describes complete line of "Ideal" elevator-door hardware and checking devices, also automatic safety devices.

Sedgwick Machine Works, 151 West 15th Street, New York.

Catalog and descriptive pamphlets. 4¼ x 8¼ in. 70 pp. Illustrated. Descriptive pamphlets on hand power freight elevators, sidewalk elevators, automobile elevators, etc.

FENCES

The Stewart Iron Works Company, Cincinnati, Ohio.

Book of Designs "B." 9 x 12 in. 80 pp. Illustrated. Book of designs illustrated from photographs of ornamental iron fence and entrance gates erected by us. Valuable to architects.

FIRE DOORS—See Doors, Windows and Trim, Metal

FIREPLACE EQUIPMENT

Covert Co., H. W., 137 E. 46th Street, New York, N. Y.

Hints on Fireplace Construction. Catalog. 5⅝ x 8½ in. 11 pp. Illustrated. Diagrams of construction and installation of Covert "Improved" and "Old Style" Dampers and Smoke Chambers. Also illustrations of Covert brass and wrought iron Fireplace Fittings.

FIREPROOFING—See also Construction, Fireproof

The General Fireproofing Company, Youngstown, Ohio.

Fireprofing Handbook. 64 pp. 8½ x 11 in. Illustrated. Gives methods of construction, specifications, data on Herringbone metal lath, steel tile, Trussit solid partitions, steel lumber, self-centering formless concrete construction.

FLOOR HARDENERS (CHEMICAL)

General Chemical Company, 40 Rector Street, New York City.

Hard-n-tyte Engineering Service. Booklet. 16 pp. 7½ x 10½ in. Describes Hard-n-tyte and its uses in connection with surface treatments of concrete with illustrations of specific applications.

The Hard-n-tyte Specification Folder. 2 pp. 7½ x 10½ in. Gives exact specifications for concrete floor finish.

Sample Bond. 9 x 14½ in. Duplicate of Five Year Guaranty Bond furnished on floors treated with Hard-n-tyte.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York.

Lapidolith, the liquid chemical hardener. Complete sets of specifications for every building type in which concrete floors are used, with descriptions and results of tests.

FLOORING

Armstrong Cork & Insulation Co., 132 24th Street, Pittsburgh, Pa.

Linotile Floors. Catalog. 6 x 9 in. 40 pp. Color Plates. Describes Linotile, a composition of ground cork, wood flour, linseed oil and various gums and pigments in tile form.

Armstrong's Cork Tile. Revised Edition. Booklet. 24 pp. 5 x 7 in. Illustrated in color. Contains complete specifications.

Armstrong Cork Co., (Linoleum Dept), Lancaster, Pa.

Armstrong's Linoleum Floors. Catalog. 8½ x 11 in. 54 pp. Color plates. A technical treatise on linoleum, including table of gauges and weights and specifications for installing linoleum floors.

Decorative Floors. Booklet. 11¼ x 15 in. 16 pp. Color plates.

Armstrong's Linoleum Pattern Book, 1923. Catalog. 3½ x 6 in. 168 pp. Color Plates. Reproductions in color of all patterns of linoleum and cork carpet in the Armstrong line.

Quality Sample Book. Three books. 3½ x 5¾ in. Showing all gauges and thicknesses in the Armstrong line of linoleum and cork carpets.

Detailed Directions for Laying and Caring for Linoleum. Handbook 5 x 7 in. 48 pp. Instructions for linoleum layers and others interested in learning most satisfactory methods of laying and taking care of linoleum.

Business Floors. Booklet. 6 x 9 in. 48 pp. Illustrated in color. Explains use of linoleum for offices, stores, etc., with reproductions in color of suitable patterns, also specifications and instructions for laying.

Bonded Floors Company, Inc., New York, N. Y.

Gold-Seal Treadlite Tile. Booklet. 7⅞ x 10¾ in. 32 pp. Illustrated. An illustrated booklet showing Treadlite Tile installations and containing general information, specifications, etc., with reproductions of the product in color.

Gold-Seal Rubber Tile Folder. Folder 7⅛ x 10¾ in. 8 pp. Illustrated. A folder describing the usages and composition of Rubber Tile. Profusely illustrated with pictures of installations and reproductions of the product in color.

Muller Co., Franklyn, R., Waukegan, Ill.

Asbestone Composition Flooring. Circulars, 8½ x 11 in. Descriptions and Specifications.

The Nairn Linoleum Company, 179 Belgrove Drive, Kearny, N. J.

Linoleum Booklet. 5½ x 8½ in. 68 pp. Illustrated in color. Reproductions in color of Inlaid, Printed, Plain and Battleship Linoleum; also Cork Carpets and Felt Base Floor Coverings.

Stedman Products Company, South Braintree, Mass.

Six-page folder. 8½ x 10½ in. Illustrated in colors, giving complete description of Stedman Naturized Flooring, Tiles, Wainscoting, Sanitary Bases, Stair Treads, etc. Technical data, recommendations, and special flooring service.

FURNACES—See Heating Equipment

FURNITURE

Allen, Louis L., 521 Madison Ave., New York, N. Y.

Booklet. 5 x 7½ in. Illustrated. Issued twice a year, listing many antique pieces of furniture, old oak and pine paneling and garden figures: fountains, bird baths, sundials, etc.

American Seating Co., 14 E. Jackson Blvd., Chicago, Ill.

Ars Ecclesiastica Booklet. 8½ x 11 in. 48 pp. Illustrations of church fitments in carved wood.

Theatre Chairs. Booklet. 6 x 9 in. 48 pp. Illustrations of theatre chairs.

The Bamberger Ideal Home
Newark, N. J.

Francis Nelson, Architect
C. F. Karser, Plumbing Contractor

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In Canada: ANACONDA AMERICAN BRASS LIMITED, NEW TORONTO, ONTARIO

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 90*

FURNITURE—Continued

Hampton Shops, 18 East 50th St., New York, N. Y.
Glimpses from Hampton Exhibits. Brochure. 16 pp. 5 x 7½ in. Illustrated. Shows examples of Hampton work and gives one an idea of their resources. Of interest to the client as well as to the architect.

Kensington Mfg. Company, 14 East 32nd St., New York, N. Y.
Photographs and full description of hand-made furniture in all the period styles furnished promptly in response to a specific inquiry.
Illustrated booklet indicative of the scope, character and decorative quality of Kensington furniture mailed on request.

GLASS CONSTRUCTION

Mississippi Wire Glass, 220 Fifth Avenue, New York.
Mississippi Wire Glass. Catalog. 3⅞ x 8½ in. 32 pp. Illustrated. Covers the complete line.

Plate Glass Mfrs. of America. First National Bank Bldg., Pittsburg, Pa.
Plate Glass. Booklet. 5¾ x 9¼ in. 12 pp. Describes manufacture and use of plate glass, with sizes.

GRANITE—See Stone, Building

HARDWARE

The American Pulley Company, 4200 Wissahickon Ave., Philadelphia, Pa.
Sash Pulleys of Pressed Metal. Booklet. 7½ x 5½ in. 44 pp. Illustrated. Contains description of pressed metal sash pulley, with complete dimensions and style numbers for finishes and trade name.

Cutler Mail Chute Company, Rochester, N. Y.
Cutler Mail Chute Model F. Booklet. 4x 9¼ in. 8 pp. Illustrated.

McCabe Hanger Manufacturing Company, 425 West 25th St., New York, N. Y.
Elevator Door Hangers. Booklet. 6 x 9 in. 8 pp. Illustrated. Descriptive booklet showing different types of elevator door hangers. Full size details sent upon request.
Special Folding and Accordion Door Hangers. Booklet. 6 x 9 in. 8 pp. Illustrated. Booklet with complete description of various types of folding and accordion door hangers. Full size details upon request.

McKinney Mfg. Co., Pittsburgh, Pa.
McKinney Complete Garage Hardware Sets. Catalog. 6¾ x 10 in. 20 pp. Illustrated. Describes full line of complete garage hardware sets for all kinds of entrances, with views of typical entrances and sketches.
McKinney Hinges and Butts. General Catalog. 6¾ x 10 in. Illustrates and describes complete line of McKinney wrought builders' hardware products, including hinges, butts, door hangers and track, latches, garage hardware and specialties.

Richard-Wilcox Mfg. Co., Aurora, Ill.
Distinctive Garage Door Hardware. Booklet. 8½ x 11 inches. 65 pp. Illustrated. Complete information accompanied by data and illustrations on different kinds of garage door hardware.

Sargent & Company, New Haven, Conn.
Sargent Locks and Hardware, Architects' Edition. 9 x 12 in. 762 pages. Illustrated. The latest complete catalogue of Locks and Hardware.
Details to Which Standard Hardware Can Be Applied. Booklet 6 pp. 9 x 12 inches, illustrated. Treats with diagrams, portions of doors and windows to which hardware can be applied.

Vonnegut Hardware Co., Indianapolis, Ind.
Von Duprin Self-Releasing Fire Exit Devices. Catalog. 12F. 8 x 11 in. 41 pp. Illustrated.
"Saving Lives." Booklet. 3¼ x 6 in. 16 pp. Illustrated. A brief outline why Self-Releasing Fire Exit Devices should be used.

HEATING EQUIPMENT

American District Steam Company, North Tonawanda, N. Y.
Adsco Heating. Bulletin No. 158. 6¼ x 9¼ in. 16 pp. Illustrated. Describes Adsco System of Atmospheric Steam Heating, its principle and operation.
Catalog No. 21-AF. 6 x 9 in. 200 pp. Illustrated. Lists and describes the full line of equipment and devices manufactured for use on underground and interior steam mains, expansion joints, steam meters, condensation meters, traps, flange fittings, angle fittings, manhole curbs, alignment guides, etc.

Clarage Fan Company, Kalamazoo, Mich.
Catalog No. 52. 8½ x 11 in. 84 pp. Illustrated. Describes Clarage Kalamazoo Multiblade Fans and Heaters for use in schools, churches, hospitals and industrial plants. Engineering data, capacity tables and dimensions included.

James B. Clow & Sons, 534 S. Franklin Street, Chicago, Ill.
Gasteam. Catalog. 6 x 9 in. 16 pp. Illustrated. New radiator using gas for fuel.

Excelso Specialty Works, 119 Clinton St., Buffalo, N. Y.
Excelso Water Heater. Booklet. 12 pp. 3 x 6 in. Illustrated. Describing the new Excelso method of generating domestic hot water in connection with heating boilers. (Firepot Coil eliminated.)

The Fulton Company, Knoxville, Tenn.
Sylphon Temperature Regulators. Bulletin T-103. 8½ x 11 in. 16 pp. Complete data on Sylphon temperature regulators for air and liquids. Catalog 100, complete line Sylphon Heating Specialties.
Damper Regulators, Air and Vent Valves. Catalog No. 100. 3¾ x 6¼ in. Sylphon Damper Regulators for steam, hot water and vapor systems. Sylphon Air and Vent Valves.

Illinois Engineering Co., Racine Ave. at 21st St., Chicago, Ill.
Vapor Heat Bulletin 21. 8½ x 11 in. 32 pp. Illustrated. Contains new and original data on Vapor Heating. Rules for computing radiation, pipe sizes, radiator tappings. Steam table showing temperature of steam and vapor at various pressures, also description of Illinois Vapor Specialties.

Johnson Service Company, 149 Michigan St., Milwaukee, Wis.
Regulation of Temperature and Humidity. Booklet. 11¼ x 8½ in. 64 pp. Illustrated. Describes Johnson system of pneumatic, automatic regulation of temperature and humidity, and illustrates thermostats, valves, air compressors, dampers, and other parts.

HEATING EQUIPMENT—Continued

Johnson Electric Thermostats, Valves and Controllers. Booklet. 6⅛ x 3½ in. 24 pp. Illustrated. Excellent plates showing electric thermostats and controllers.

Kelsey Heating Company, James St., Syracuse, N. Y.
Booklet No. 5. 4 x 9 in. 32 pp. Illustrated. A dealers' booklet showing the Kelsey Warm Air Generator Method of warming and distributing air. Gives dimensions, heating capacities, weights, kind of coal recommended, and shows the mechanical and gravity system of heating homes, churches and schools.
Monroe Pipeless Booklet, 4½ x 8 in. 20 pp. Illustrated.
Monroe Tubular Heater. Booklet. 4½ x 8 in. 20 pp. Illustrated. General Booklet giving capacities, dimensions, weights, etc.
Syracuse Pipeless Booklet. 4½ x 8 in. 12 pp. Illustrated. General Booklet giving sizes and capacities.

Kewanee Boiler Co., Kewanee, Ill.
Kewanee on the Job. Catalog. 8½ x 11 in. 80 pp. Illustrated. Showing installations of Kewanee boilers, water heaters, radiators, etc.
Catalog No. 73. 6 x 9 in. 35 pp. Illustrated. Describes Kewanee steel power boilers with complete specifications.

Minneapolis Heat Regulator Co., Minneapolis, Minn.
The Heart of the Heating Plant. Catalog. 6 x 9 in. 20 pp. Illustrated. Describing the Minneapolis Heat Regulator, its construction, application and operation for the automatic control of temperature where coal, gas, fuel oil or street steam is used.
Use of MINNEAPOLIS HEAT REGULATOR in connection with central station heating. 3¼ x 6 in. 12 pages. Illustrated. Descriptive folder showing the application of single unit heat regulators to central station heating, for office buildings or homes, including installation diagram and records of saving.
Minneapolis Dual Control. 3¼ x 6 in. 12 pages. Illustrated. Dual automatic temperature control, both of room temperatures and boiler temperatures or pressures. A system that insures perfect heat regulation and fuel saving with hot water, steam, or vapor heating.

Page Boiler Company, The Wm. H., 141 West 36th Street, New York, N. Y.
Page Boilers. **"The Distinguished Service Line."** Catalog. 4½ x 7½ in. 120 pp. Illustrated. Descriptions with specifications of the "Volunteer" Round and "Monarch" Square Sectional Steam and Hot Water Boilers—the "Monarch" Up-Draft Smokeless and Down-Draft Smokeless Boilers—Push Nipple and Header Types—with method for apportioning size of boiler and radiation, and other valuable heating data.
"Volunteer" Round Boilers. Folder, 6¼ x 9½ in. Illustrated. Ratings and dimensions, and assemblage of the various series.
"Monarch" (Regular) Square Sectional Boilers. Push Nipples and Header Types. Folder. 8 x 11 in. Illustrated. Description, ratings and Header Types. Folder. 8 x 11 in. Illustrated. Description, ratings and dimension.
"Monarch" Up-Draft Smokeless and Down-Draft Smokeless Boilers. Push Nipple and Header Types. Folders. 8 x 11 in. Illustrated. Description of the features which adapt the "Monarch" Up-Draft Smokeless for the use of any available fuel, a vital factor in these times of shortage and substitution. Ratings and dimensions.

Utica Heater Company, Utica, N. Y.
Imperial Round and Square Boilers and Supplies. Catalog. 3½ x 6½ in. Gives complete data on small heaters.
Special Folders. 8½ x 11 in. "Warmth and Comfort," describing the scientifically correct NEW IDEA pipeless furnaces. "SUPERIOR Warm Air Pipe Furnaces," a standard line of heating equipment for over forty years. "SUPER-SMOKELESS Pipe and Pipeless Furnaces," a new and remarkably efficient warm air heater, burning cheap soft coal without smoke—utilizing the principle of the Bunsen Burner.
"Imperial Sectional Square Boilers," for hard coal heating of all types of buildings.
Utica Imperial SUPER-SMOKELESS Boiler. Catalog. 8½ x 11 in. Consists of the following seven bulletins, either loose or bound together: (1) School Heating Bulletin. (2) Public Building Bulletin. (3) Theatre Heating Bulletin. (4) Churches and Religious Institutions. (5) Residences, Apartments and Hotels. (6) Offices, Industrial Buildings and Garages. (7) Technical Bulletin describing patented Bunsen Burner design and construction of the SUPER-SMOKELESS BOILER, which burns the cheapest grades of soft coal smokelessly and operates equally well with hard coal, coke or fuel oil.

HEAT REGULATORS—See Heating Equipment

HOISTS—See Ash Hoists

HOLLOW TILE—See Tile, Hollow

HOSPITAL EQUIPMENT

The International Nickel Company, 67 Wall St., New York, N. Y.
Hospital Applications of Monel Metal. Booklet. 8½ x 11½ in. 16 pp. Illustrated. Gives types of equipment in which Monel Metal is used, reasons for its adoption, with sources of such equipment.

The Kny-Scheerer Corporation of America, 119 Seventh Ave., New York.
Hospital Equipment, 16th Edition. 7¼ x 10½ in. 232 pp. Illustrated. Complete description of Hospital and Surgical Furniture, Hospital Appliances including Operating Tables, Cabinets, Sterilizers for Water, Dressing and Instruments, also Hydrotherapeutic Apparatus.
Surgical Sundries. P/2 Edition. Booklet. 7⅜ x 10½ in. 48 pp. Illustrated. A complete line of glassware, enamelware, rubber goods, restraint apparatus, instrument sterilizers, sputum cups, wheel chairs and sick room comforts.
Electro-Medical. 25th Edition. Booklet. 7¼ x 10½ in. 160 pp. Illustrated. A complete line of Albee Bone Sets, Apparatus for AC and DC, Cystocopes, Heat Magnets, Vibrators, Compressors, Electric Light Baths, High Frequency Apparatus and X-Ray Apparatus and Accessories.

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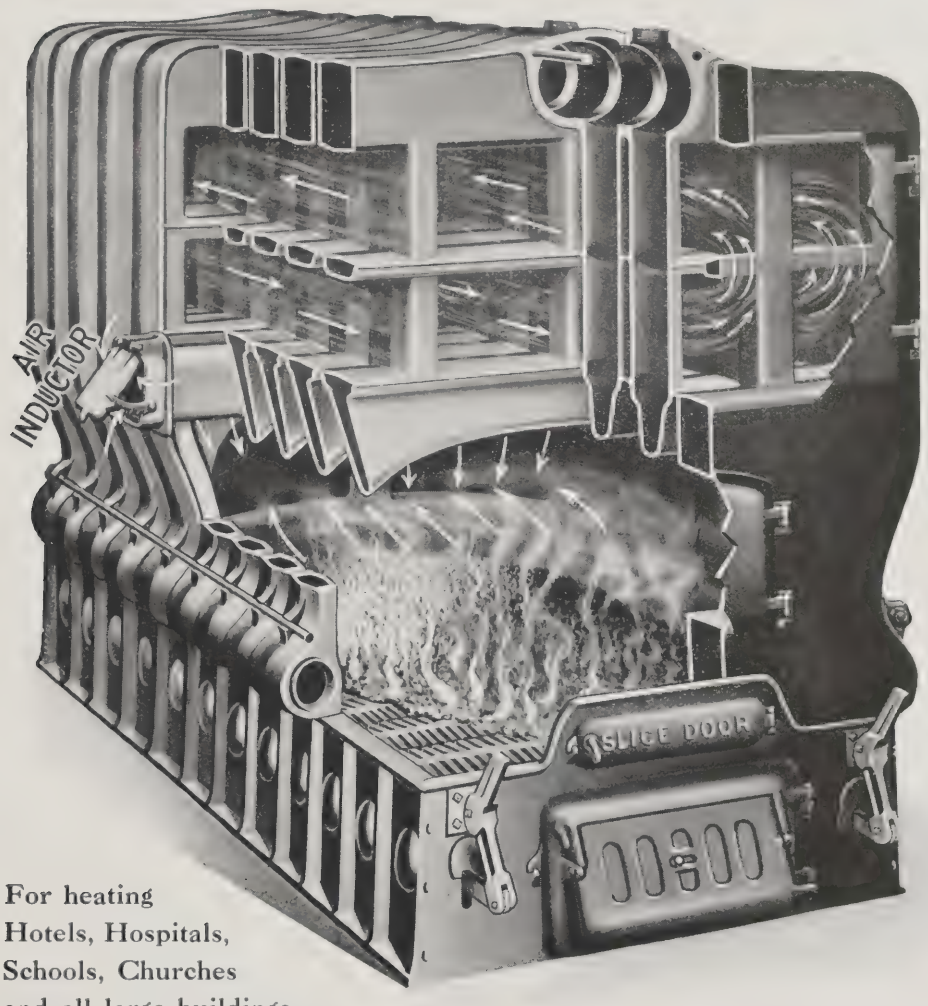

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 92*

INCINERATORS

The Kerner Incinerator Company, 1029 Chestnut St., Milwaukee, Wis.
The Kernerator. Booklet. 5½ x 9¼ in. 40 pp. Illustrated. Describes principle and design of the Kernerator, guarantee and service, also gives illustrations of buildings where it has been installed and testimonials.
Sanitary Elimination of Household Waste. Booklet. 4 x 9 in. 16 pp. Illustrated. Shows process, installations and advantages of the Kernerator.
Sanitary Disposal of Waste in Hospitals. Booklet. 4 x 9 in. 12 pp. Illustrated. Shows how this necessary part of hospital service can be taken care of by the Kernerator.

INSULATION

Bishopric Manufacturing Co., 103 Este Ave., Cincinnati, Ohio.
Specifications and Working Details. Booklet. 7¾ x 10½ in. Illustrated. Contains plainly written instructions for the use of stucco, stucco base, plaster base and insulation base.

Philip Carey Co., The, Cincinnati, Ohio.
Carey Asbestos and Magnesia Products. Catalog. 6 x 9 in. 72 pp. Illustrated.

Johns-Manville, Inc., Madison Ave., and 41st St., New York, N. Y.
Johns-Manville Service to Power Users. Catalog. 8½ x 11 in. 150 pp. Illustrated. Contains valuable data on all forms of insulations, packings, steam traps, high temperature cements, brake locks and linings, also general technical data.

United States Mineral Wool Co., 280 Madison Ave., New York.
The Uses of Mineral Wool in Architecture. Booklet. 5¼ x 6⅝ in. 24 pp. Illustrated. Describes properties of mineral wool as insulation against heat, frost, sound. Specifications and section drawing for use as a fireproofing. Rule for estimate and cost.

KITCHEN EQUIPMENT

Colt's Patent Fire Arms Mfg. Company, Hartford, Conn.
AUTOSAN Dish and Silver Cleaning Machines. Booklets. 6 x 9 in. Describing rotary table type and conveyor type machines.

Wm. M. Crane Company, 16-20 West 32nd St., New York, N. Y.
VULCAN Gas Ranges and Appliances. Booklet. 5 x 8 in. 50 pp. Illustrated. Describes complete line, including VULCAN SMOOTH TOP Compact Cabinet Gas Ranges for kitchens in the home.
VULCAN Gas Equipment for Hotels, Hospitals, Restaurants, etc. Booklet. 5 x 8 in. 45 pp. Illustrated. Equipment for heavy-duty cooking requirements, with information of value to architects in planning kitchens.

The International Nickel Company, 67 Wall St., New York, N. Y.
Hotels, Restaurants and Cafeteria Applications of Monel Metal. Booklet. 8½ x 11 in. 32 pp. Illustrated. Gives types of equipment in which Monel Metal is used, with service data and sources of equipment.

Pick & Company, Albert, 208 W. Randolph St., Chicago, Ill.
School Cafeterias. Portfolio. 17 x 11 in. 44 pp. Illustrated. An exhaustive study of the problems of school feeding, with copious illustrations and blue prints. Very valuable to the architect.
Hotel, Apartment Building, Club and Institution Installations. Portfolio. 17 x 11 in. 100 pp. Shows, mostly by plates, how the Albert Pick Company equips hotels completely from top to bottom.
Equipment for Cafeterias, Lunch Rooms, Restaurants, and Dining Rooms Portfolio. 17 x 11 in. 86 pp. Illustrated. The last word in Cafeteria equipment to meet all requirements.

LATH, METAL AND REINFORCING

The General Fireproofing Company, Youngstown, Ohio.
Herringbone Metal Lath Handbook. 8½ x 11 in. 32 pp. Illustrated. Standard specifications for Cement Stucco on Herringbone Rigid Metal Lath and interior plastering.

National Steel Fabric Company, Pittsburgh, Pa.
Folder. 8½ x 11 in. 6 pp. Illustrated. Describes National Stucco-Plaster Reinforcement, a base for exterior stucco and interior plastering, composition flooring, etc., with photographs and drawings.

North Western Expanded Metal Co., 1234 Old Colony Building, Chicago, Ill.
Designing Data. Catalog. 6 x 9 in. 94 pp. Illustrated. Describes most efficient use of Econo Expanded Metal Reinforcing. Formless Concrete Construction. Catalog. 6 x 9 in. 80 pp. Illustrated. Describes use of T-Rib Chanelath, a form and reinforcing for concrete.

LAUNDRY CHUTES

The Pfaudler Company, 217 Cutler Building, Rochester, N. Y.
Pfaudler Glass-Lined Steel Laundry Chutes. Booklet. 5⅛ x 7⅜ in. 16 pp. Illustrated. A beautifully printed brochure describing in detail with architects' specifications THE PFAUDLER GLASS LINED STEEL LAUNDRY CHUTES. Contains views of installations and list of representative ones.

LAVATORY ACCESSORIES

Cortes Ward Company, Inc., 245 West 55th St., New York, N. Y.
Literature to show how an appreciation service may be rendered to employees or patrons through the use of Lily Pads and Lily Vending Machines.

LEADERS AND GUTTERS

Copper & Brass Research Assn., 25 Broadway, New York, N. Y.
Copper Roofing. Booklet. 8½ x 11 in. 32 pp. Illustrated. Gives information regarding weights of various roofing materials. Describes up-to-date practice and methods of laying copper roofs; decorative effects and how to obtain them. Gives specifications and details. Flashings, reglets, gutters and leaders, cornices and copper-covered walls.

United Alloy Steel Corporation, Canton, Ohio.
Better Sheet Metal, 8½ x 11 in. 128 pages and cover. Illustrated. Shows the many uses of Toncan Metal with many pictures of buildings, names of architects, etc., also tables of weights and other useful specification data.

MAIL CHUTES

Cutler Mail Chute Company, Rochester, N. Y.
Cutler Mail Chute Model F. Booklet. 4 x 9¼ in. 8 pp. Illustrated.

MANTELS

Arthur Todhunter, 414 Madison Ave., New York, N. Y.
Mantels and Fireplace Equipment. Booklet. 8½ x 11 in. Illustrated. Separate sheet plates showing mantels installed and furnished, also andirons and grates grouped with suitable pieces, also lanterns, weather-vanes and hand-wrought hardware. All sizes and descriptions given on each plate.

MARBLE

The Georgia Marble Company, Tate, Ga. New York Office, 1328 Broadway.
Why Georgia Marble is Better. Booklet. 3⅜ x 6 in. Gives analysis, physical qualities, comparison of absorption with granites, opinions of authorities, etc.
Convincing Proof. Booklet. 3⅜ x 6 in. 8 pp. Classified list of buildings and memorials in which Georgia Marble has been used, with names of Architects and Sculptors.

Tompkins-Kiel Marble Company, 505 Fifth Ave., New York, N. Y.
Reproductions in natural colors of imported and domestic marbles and stone for interior and exterior uses.
Bulletins. 9¾ x 12¾ in. illustrating buildings of various types in which Tompkins-Kiel Marble Company's imported and domestic marbles and stone have been used.

METAL LATH—See Lath, Metal and Reinforcing

METALS

American Sheet & Tin Plate Co., Frick Building, Pittsburgh, Pa.
Reference Book. Pocket Ed. 2½ x 4½ in. 168 pp. Illustrated. Covers the complete line of Sheet and Tin Mill Products.
Apollo and Apollo-Keystone Galvanized Sheets. Catalog. 8½ x 11 in. 20 pp. Illustrated.
Research on the Corrosion Resistance of Copper Steel. Booklet. 8½ x 11 in. 24 pp. Illustrated. Technical information on results of atmospheric corrosion tests of various sheets under actual weather conditions.
Facts Simply and Briefly Told. Booklet. 8½ x 11 in. 16 pp. Illustrated. Non-technical statements relating to Keystone Copper Steel.
Black Sheets and Special Sheets. Catalog. 8½ x 11 in. 28 pp. Illustrated. Describes standard grades of Black and Uncoated Sheets, together with weights, bundling tables, etc.
Bright Tin Plates. Catalog. 8½ x 11 in. 16 pp.

Bridgeport Brass Company, Bridgeport, Conn.
Seven Centuries of Brass Making. Booklet. 10½ x 8 in. 78 pp. Illustrated in color. A brief history of the ancient art of Brass Making and its early (and even recent) method of production—contrasted with that of the Electric Furnace Process—a twentieth century achievement of the Bridgeport Brass Company.
Tested High-Speed Brass Rod. Booklet 10½ x 8 in. 16 pp. Illustrated. Short treatise on the manufacture of Brass Rod for use in Screw Machines, with particular reference to improvements originated by the Bridgeport Brass Company.

Copper & Brass Research Assn., 25 Broadway, New York, N. Y.
Copper Roofing. Booklet. 8½ x 11 in. 32 pp. Illustrated. Gives information regarding weights of various roofing materials. Describes up-to-date practice and methods of laying copper roofs; decorative effects and how to obtain them. Gives specifications and details. Flashings, reglets, gutters and leaders, cornices and copper-covered walls.

The International Nickel Company, 67 Wall St., New York, N. Y.
The Choice of a Metal. Booklet. 6¼ x 3¼ in. 16 pp. Illustrated. Monel Metal—its qualities, use and commercial forms, briefly described.

United Alloy Steel Corporation, Canton, Ohio.
Sheet Metal Primer. 5¼ x 7¾ in. 32 pages and cover. Illustrated. A non-technical description of the making of iron and steel from ore to sheet metal and a brief discussion of modern developments in this field.
Metallurgy of Modern Commercial Iron Sheets. Booklet. 3⅛ x 6¼ in. 16 pages. An interesting discussion of the methods used in producing metal sheets.

METAL TRIM—See Doors and Trim, Metal

MILLWORK—See also Wood

Curtis Companies Service Bureau, Clinton, Iowa.
Architectural Interior and Exterior Woodwork, Standardized. Book. 9 x 11½ in. 240 pp. Illustrated. This is an Architects' Edition of the complete catalog of Curtis Woodwork, as designed by Trowbridge & Ackerman. Contains many color plates.
Better Built Homes, Vols. XV-XVIII incl. Booklet. 9 x 12 in. 40 pp. Illustrated. Designs for houses of five to eight rooms, respectively, in several authentic types, by Trowbridge & Ackerman, architects for the Curtis Companies.
Curtis Details. Booklet. 19½ x 23½ in. 20 pp. Illustrated. Complete details of all items of Curtis woodwork, for the use of architects.

MORTAR COLORS

Clinton Metallic Paint Co., Clinton, N. Y.
Clinton Mortar Colors. Folder. 8½ x 11 in. 4 pages. Illustrated in color, gives full information concerning Clinton Mortar Colors with specific instructions for using them.
Color Card. 6½ x 3¼ in. Illustrates in color the ten shades of which Clinton Mortar Colors are manufactured.

OFFICE SUPPLIES

Chas. M. Higgins & Co., 271 Ninth Street, Brooklyn, N. Y.
Descriptive Catalog. 3½ x 5½ in. 27 pages. Illustrated. Contains description and prices of Higgins Inks and Adhesives. Color Card illustrating various colors of the drawing inks supplied separate, size 3½ x 6¼.

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See Sweet's for Specifications

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 94*

PAINTS, STAINS, VARNISHES AND WOOD FINISHES

Acme White Lead & Color Works, Detroit, Mich.
Booklet. 9 x 12 inches, 44 pp. Specifications for paint, enamel, varnish and dampproofing material.

Boston Varnish Co., Everett Station, Boston 49, Mass.
The Inviting Home. Booklet. 5½ x 8 in. 16 pp. Illustrations in colors of attractive interiors.
Set of Twelve Measured Drawings. 8½ x 11 in.
Kyanize—Its Important Place in Recent Eastern Architecture. Booklet. 6 x 9 in. 16 pp. Varnish and Enamel Specifications.

Cabot, Inc., Samuel, Boston, Mass.
Cabot's Creosote Stains, Booklet. 4 x 8½ in. 16 pp. Illustrated.

The Glidden Company, Cleveland, Ohio.
"More Daylight." 8 x 10½ in. 20 pp. Portraying by illustrations and text the need and methods of modern mill painting.

The Hockaday Company, 1823 Carroll Ave., Chicago, Ill.
Paint Mileage. Book. 8 x 10½ in. 56 pp. Illustrated. A reference book on interior painting. Describes use of paint over all sorts of surfaces, with illustrations of buildings where Hockaday has been specified. Hockaday service explained.
Solving Your Paint Problems. Booklet. 8½ x 11 in. 44 pp. Illustrated. Describes use of Hockaday Paint in Industrial Buildings, particularly in textile mills. Details of Hockaday service and specifications.

Martin Varnish Co., 2500 Quarry St., Chicago, Ill.
Architectural Specifications. Booklet. 8½ x 11 in. 20 pp. Illustrated. Complete guide for Architects in specifying Martin Varnish Products.
Your Floors. Booklet. 5 x 7 in. 20 pp. Illustrated. Explains fully how to finish all kinds of floors and woodwork with Martin's Pure Varnish.

Murphy Varnish Company, 234 McWhorter St., Newark, N. J.
The Book of Decoration. Booklet. 46 pp. 8½ x 11 in. Illustrated. Written and illustrated by masters of the art. Old and modern interiors by famous Architects. Characteristic paneling, ceilings, floors, hangings and furnishings of each period are illustrated and charted. Price 50 cents.
Eight Periods and Their Modern Adaptation. Furnished to Architects and Builders. In this volume the historic architectural periods are illustrated with authentic photographs of famous interiors. Each period is charted to show correct treatment for different rooms. Complete architectural specifications included.
Univernish, the Universal Varnish. Booklet. 3¼ x 6 in. 8 pp. Describes the uses, working and economy of Univernish.
Muronic Enamel. Descriptive leaflet and price-list. 4 pp. 4 x 6 in.

National Lead Company, 111 Broadway, New York, N. Y.
Handy Book on Painting. Book. 5½ x 3¼ in. 100 pp. Gives directions and formulas for painting various surfaces of wood, plaster, metal, etc., both interior and exterior.
Red Lead in Paste Form. Booklet. 6¼ x 3½ in. 16 pp. Illustrated. Directions and formulas for painting metals.
Came Lead. Booklet. 8¾ x 6 in. 12 pp. Illustrated. Describes various styles of lead cames.
Cinch Anchoring Specialties. Booklet. 6 x 3½ in. 20 pp. Illustrated. Describes complete line of expansion bolts.

The Ripolin Company, Cleveland, Ohio.
Ripolin Specifications. Book. 8 x 10¼ in. 12 pp. Complete specifications and general instructions for the application of Ripolin, the original Holland enamel paint. Also directions for proper finishing of wood, metal, plaster, concrete, brick and other surfaces.
"Why Ripolin Has an International Reputation." 8 x 10¾ in. 24 pp. Designed for the architect's files to illustrate the many varied uses of Ripolin Enamel Paint in all parts of the world. Profusely illustrated.

Ruberoid Co., The (formerly the Standard Paint Co.), 95 Madison Avenue, New York, N. Y.
Preservative Coatings. Booklet. 6 x 9 in. 15 pp. Illustrated. Presents in a concise manner the properties and uses of the Ruberoid Company's various paint preparations.

Sherwin-Williams Company, 601 Canal Rd., Cleveland, Ohio.
Painting Concrete and Stucco Surfaces. Bulletin No. 1. 8½ x 11 in. 8 pp. Illustrated. A complete treatise with complete specifications on the subject of Painting of Concrete and Stucco Surfaces. Color chips of paint shown in bulletin.
Enamel Finish for Interior and Exterior Surfaces. Bulletin No. 2. 8½ x 11 in. 12 pp. Illustrated. Thorough discussion including complete specifications for securing the most satisfactory enamel finish on interior and exterior walls and trim.
Painting and Decorating of Interior Walls. Bulletin No. 3. 8½ x 11 in. 20 pp. Illustrated. A wonderful reference book on Flat Wall Finish including texture effects which are taking the country by storm. Every architect should have one on file.
Protective Paints for Metal Surfaces. Bulletin No. 4. 8½ x 11 in. 12 pp. Illustrated. A highly technical subject treated in a simple, understandable manner.

Smith & Co., Edward, P. O. Box 76, City Hall Station, New York, N. Y.
Architect's Handoook. 3¾ x 7½ in. 24 pp. Specifications and suggestions for painting, varnishing, enameling, etc.

Sonneborn Sons, Inc., L., Dept. 4, 116 Fifth Avenue, New York.
Paint Specifications. Booklet. 8½ x 10¾ in. 4 pp.

PANELING—See Millwork

PARTITIONS

Improved Office Partition Company, 25 Grand St., Elmhurst, L. I.
Telesco Partition, Catalog. 8¼ x 11 in. 14 pp. Illustrated. Shows typical offices laid out with Telesco partitions, cuts of finished partition units in various woods. Gives specifications and cuts of buildings using Telesco.
Detailed Instructions for erecting Telesco Partitions. Booklet. 24 pp. 8½ x 11 in. Illustrated. Complete instructions, with cuts and drawings, showing how easily Telesco Partition can be erected.

PARTITIONS—Continued

Richards-Wilcox Mfg. Co., Aurora, Ill.
Partitions. Booklet. 7 x 10 in. 32 pp. Illustrated. Describes complete line of track and hangers for all styles of sliding, parallel, accordion and flush door partitions.

The J. G. Wilson Corporation, 11 East 36th St., New York, N. Y.
Rolling Partitions, Hygienic and Disappearing Door Wardrobes. Booklet. 6 x 9 in. 32 pp. Illustrated. Describes rolling partitions, particularly in churches and schools, and wardrobes as installed in schools and public institutions.

PIPE

American Brass Company, Waterbury, Conn.
Bulletin B-1, "Brass Pipe for Water Service." 8½ x 11 in. 28 pp. Illustrated. Gives schedule of weights and sizes (I.P.S.) of seamless brass and copper pipe, shows typical installations of brass pipe, and gives general discussion of the corrosive effect of water on iron, steel and brass pipe.

Bridgeport Brass Company, Bridgeport, Conn.
Bulletin No. 15. Brass Pipe and Piping. Booklet. 8 x 10½ in. 48 pp. Illustrated. When and how to use Brass Pipe. Brass pipe compared with iron and steel pipe for hot water service. Corrosion. Description of manufacture of Bridgeport Plumrite Brass Pipe.

A. M. Byers Company, 235 Water St., Pittsburgh, Pa.
Bulletin 26-A. "What is Wrought Iron?" 8 x 10¾ in. 40 pp. Illustrated. Descriptions of materials and processes employed in manufacturing Byers genuine wrought iron pipe. Factors influencing corrosion. Gives table of pipe sizes, weights, dimensions, tests, etc., and tabulated records of the life of iron and steel pipe in various kinds of service.
Bulletin 30. An Investigation of Pipe Corrosion in Hot Water Service. 8 x 10¾ in. 20 pp. Illustrated. Shows service records of iron, steel and brass pipe used for hot and cold water supply lines in 129 Pittsburgh Apartment Buildings.
Bulletin 32. Corrosion of Wright Iron, Cast Iron and Steel Pipe in House Drainage Systems. 8 x 10¾ in. 32 pp. Illustrated. Data obtained through investigations conducted in New York and Chicago by Dr. Wm. P. Gerhardt, C. E., and Thomas J. Claffy, Asst. Chief San. Inspector city of Chicago.
Bulletin 38. The installation Cost of Pipe. 32 pp. 8 x 10¾ in. Illustrated. Cost analysis of 20 different pipe installations, in power and industrial plants, office buildings, hotels, residences, etc.

Clow & Sons, James B., 534 S. Franklin Street, Chicago, Ill.
Catalog "A," 4 x 6½ in. 700 pp. Illustrated. Shows a full line of steam, gas and water works supplies.

National Tube Co., Frick Building, Pittsburgh, Pa.
"National" Bulletin No. 2. Corrosion of Hot Water Pipe. (8½ x 11 in. 24 pp.) Illustrated. In this bulletin is summed up the most important research dealing with hot water systems. The text matter consists of seven investigations by authorities on this subject.
"National" Bulletin No. 3. The Protection of Pipe Against Internal Corrosion (8½ x 11 in. 20 pp.) Illustrated. Discusses various causes of corrosion and details are given of the deactivating and deaerating systems for eliminating or retarding corrosion in hot water supply lines.
"National" Bulletin No. 25. "National" Pipe in Large Buildings. 8½ x 11 in. 88 pp. This bulletin contains 254 illustrations of prominent buildings of all types, containing "National" Pipe and considerable engineering data of value to architects, engineers, etc.
Modern Welded Pipe. Book of 88 pages (8½ x 11 in.), profusely illustrated with halftone and line engravings of the important operations in the manufacture of pipe.

Reading Iron Company, Reading, Pa.
Reading Genuine Wrought Iron Pipe in the Making and in Service. Bulletin No. 1. 8½ x 11 in. 32 pp. Illustrated. History of the Reading Iron Company. Origin of wrought iron—description of each process of manufacture of both buttweld and lapweld pipe —Reading Pipe in various fields.
Book of Standards. Booklet. 5 x 7 in. 48 pp. Illustrated. Complete tables showing dimensions, tests and list prices on each of the 552 different kinds of Reading Tubular goods. Two simple tests for distinguishing genuine wrought iron pipe.
The Painted Molecule. Booklet. 4 x 9 in. 8 pp. Illustrated. A brief, non-technical description of the reasons for the longer life of Reading Iron Pipe, with instances of actual service.
The Ultimate Cost, Booklet. 5¼ x 7¼ in. 24 pp. Illustrated in two colors. A comparison in actual figures of the initial cost and the ultimate cost of plumbing and heating systems in several kinds of homes.

PLUMBING EQUIPMENT

American Brass Company, Waterbury, Conn.
Benedict Nickel. Illustrated pamphlet descriptive of Benedict Nickel White Metal for high-grade plumbing fixtures.

Bridgeport Brass Company, Bridgeport, Conn.
Plumbing Supplies. Booklet. 10½ x 8 in. 20 pp. Illustrated. Describes a few of the different plumbing supplies manufactured by the Bridgeport Brass Company.

Brunswick-Balke-Collender Co., 623 S. Wabash Avenue, Chicago, Ill.
Whale-bone-ite Seat. Booklet. 3½ x 6¼ in. 4 pp. Illustrated.
Whale-bone-ite Seat. Booklet. 3½ x 6¼ in. 8 pp. Illustrated.

Clow & Sons, James B., 534 S. Franklin Street, Chicago, Ill.
Catalog "M." 9¼ x 12 in. 184 pp. Illustrated. Shows complete line of plumbing fixtures for Schools, Railroads and Industrial Plants.

Crane Company, 836 S. Michigan Avenue, Chicago, Ill.
Crane Products in World Wide Use. Catalog. 5 x 9½ in. 24 pp. Illustrated.
Plumbing Suggestions for Home Builders. Catalog. 3 x 6 in. 80 pp. Illustrated.
Plumbing Suggestions for Industrial Plants. Catalog. 4 x 6½ in. 43 pp. Illustrated.

"WHEN IT'S UP, IT'S ON"—

The next time you have occasion to take people through a recently completed house, or apartment, notice the interest with which they examine the electrical details.

The Connecticut Toggle Switch is one of those more important details, which adds a touch of originality to the electrical installation, and contributes to the atmosphere of comfort and refinement which is so characteristic of the modern home.

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No. **6279**—4-Way Switch
No. **7021**—Single Gang Plate
No. **7022**—Two Gang Plate
No. **7023**—Three Gang Plate
No. **7024**—Four Gang Plate

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Office and Factory: BRIDGEPORT, CONN.
New York Chicago San Francisco

CONNECTICUT "A-1" DEVICES

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 96*

PLUMBING EQUIPMENT—Continued

Douglas Co., The John, Cincinnati, Ohio.
Catalog "C." 10½ x 8 in. 200 pages illustrated. Illustrates and describes the Douglas complete line of China Sanitary plumbing fixture.
Booklet. "Douglas suggests for your home." 6 x 3½ in. 39 pp. Illustrated.

Eljer Company, 15 E. Van Buren St., Chicago, Ill.
The Standardized Sixteen. Booklet. 3¾ x 6¾ in. 16 pp. Illustrated. Describes fully the complete Eljer line of standardized plumbing equipment, with diagrams, weights, measurements and copious illustrations.
Standardized Sixteen. Circular. 3¾ x 6¾ in. 18 pp. Illustrated.
Complete catalog. 3¾ x 6¾ in. 104 pp. Illustrated.

Kohler Co., Kohler, Wis.
Catalog F. 7½ x 10⅝ in. 216 pp. Illustrates and describes the complete line of Kohler trade-marked plumbing ware.
Roughing-In Measurement Binder. 5 x 8 in., containing loose leaf sheets on all staple fixtures.

Maddock's Sons Co., Thomas, Trenton, N. J.
Highest Grade Standardized Plumbing Fixtures for Every Need. Catalog. 5 x 7½ in. 94 pp. Illustrated. Covers the complete line.
Bathroom Individuality. Booklet. 6 x 9 in. 28 pp. Illustrated. Showing view of complete bathrooms with complete descriptions of floor plans.
Specifications for Plumbing Fixtures. Booklet. 9 x 12 in. 8 pp. Tables of specifications for industrial buildings, schools, apartments, hotels, etc.

Speakman Company, Wilmington, Del.
Speakman Showers and Fixtures. Catalog. 4½ x 7½ in. 250 pp. Illustrated. Catalog of Modern Showers and Brass Plumbing Fixtures, with drawings showing layouts, measurements, etc.
Toned Up in Ten Minutes. Booklet. 7½ x 10½ in. 16 pp. Illustrated. Modern Showers and Washups for Industrial Plants, showing the sanitary method of washing in running water.

Wolff Manufacturing Company, 255 No. Hoyne Ave., Chicago, Ill.
Plumbing Suggestions. Catalog. 3¼ x 6 in. 50 pp. Illustrated. Illustrating, describing and pricing Wolff Quality Plumbing Fixtures for residential installation.

PUMPS

Goulds Mfg. Co., The, Seneca Falls, N. Y.
Set of Twenty Bulletins, 7½ x 10⅝ in. 12 to 32 pp. each. Illustrated. Covers complete line of power and centrifugal pumps for all services.

Kewanee Private Utilities Co. 442 Franklin St., Kewanee, Ill.
Bulletin E. 7¾ x 10¼ in. 32 pp. Illustrated. Catalog. Complete descriptions, with all necessary data, on Standard Service Pumps, Indian Brand Pneumatic Tanks, and Complete Water Systems, as installed by Kewanee Private Utilities Co.

RAMPS

Ramp Buildings Corporation, 115 Broad St., New York, N. Y.
The d'Humy Motoramp System of Building Design. Booklet. 8½ x 11 in. 20 pp. Illustrated. Describes the d'Humy system of ramp construction for garages, service buildings, factories, warehouses, etc., where it is desirable to drive motor vehicles or industrial tractors under their own power from floor to floor.
Storage Efficiency of Multi-Floor Garages. Leaflet. 8½ x 11 in. 4 pp. Illustrated. A brief discussion of comparative storage efficiencies of elevator garages, ordinary ramp garages, and d'Humy Motoramp garages.
Visibility. Pamphlet. 8½ x 11 in. 2 pp. Illustrated. Discussion of visibility feature of d'Humy Motoramp System with reference to illustration of one particular installation.
Series of Informal Bulletins on Garage Design. Sent upon request.

REINFORCED CONCRETE—See also Construction, Concrete

The General Fireproofing Company, Youngstown, Ohio.
Self-Sentering Handbook. 8½ x 11 in. 36 pp. Illustrated. Methods and specifications on reinforced concrete floors, roofs and floors with a combined form and reinforced material.

Truscon Steel Company, 250 W. Lafayette Blvd., Detroit, Mich.
Shearing Stresses in Reinforced Concrete Beams. Booklet. 8½ x 11 in. 12 pp

ROOFING

American Brass Company, Waterbury, Conn.
Service Sheets 43-1 and 43-2, standard specifications and methods of laying copper roofings, flashings, hips, valleys, decks, gutters and leaders.

American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh, Pa.
Better Buildings. Catalog. 8½ x 11 in. 32 pp. Describes Corrugated and Formed Sheet Steel Roofing and Siding Products, black, painted and galvanized, with directions for application of various patterns of Sheet Steel Roofing in various types of construction.
Copper—Its Effect Upon Steel for Roofing Tin. Catalog. 8½ x 11 in. 28 pp. Illustrated. Describes the merits of high grade roofing tin plates and the advantages of the copper-steel alloy.
"The Testimony of a Decade." Booklet. 8½ x 11 in. 16 pp., with Graphic Chart and illustration showing losses to various Iron and Steel Sheets for roofing, from atmospheric corrosion.

Philip Carey Co., Lockland, Cincinnati, Ohio.
Architects' Specifications for Carey Built-up Roofing. Booklet. 8 x 10¾ in. 24 pp. Illustrated. Complete data to aid in specifying the different types of built-up roofing to suit the kind of roof construction to be covered.
Carey Built-up Roofing for Modern School Buildings. Booklet. 8 x 10¾ in. 32 pp. Illustrated. A study of school buildings of a number of different kinds and the roofing materials adapted for each.

ROOFING—Continued

Copper & Brass Research Assn., 25 Broadway, New York, N. Y.
Copper Roofing. Booklet. 8½ x 11 in. 32 pp. Illustrated. Gives information regarding weights of various roofing materials. Describes up-to-date practice and methods of laying copper roofs; decorative effects and how to obtain them. Gives specifications and details. Flashings, reglets, gutters and leaders, cornices and copper-covered walls.

Creo-Dipt Company, 1025 Oliver St., North Tonawanda, N. Y.
Architectural Service Sheets. 8½ x 11 in. Illustrated. Working drawings of construction, with standard specifications for design and construction of same.

Federal Cement Tile Co., 110 So. Dearborn St., Chicago, Ill.
The Indestructible Roof. Booklet. 10 x 13 in. 32 pp. Illustrated. Illustrates and describes the installation of permanent concrete interlocking tile, tile with glass insets, flat tile and channel tile, on all types of industrial plants and other buildings with flat and pitched surfaces.
Standards. Booklet. 8½ x 11 in. 40 pp. Illustrated with full-page drawings. Gives full details of all forms of roof construction, of steel structure, ridge and gutter construction, purlin arrangement, spacing, etc., for standard roofs.

B. Mifflin Hood Brick Co., Atlanta, Ga.
Roof Tile—"Riviera" Mission and Shingle. Folder. 8½ x 11 in. 4 pp. Illustrated. Shows application of this tile, with suggested specifications and installation instructions. Free to architects and engineers.

Illinois Zinc Company, 332 S. Michigan Ave., Chicago, Ill.
Corrugated Sheets of Pure Rolled Zinc. Booklet. 3⅝ x 8½ in. 8 pp. Illustrated. Facts regarding adaptability of zinc for roofing. Specifications of Corrugated Zinc Sheets. Weights per square. Comparative gauge lists. Table of safe loads.
The Roof That's Always New. Booklet. 3⅜ x 6 in. 12 pp. Illustrated. Story of Illinois Zinc Shingles, their everlasting and artistic qualities. Information regarding a complete zinc roof, shingles, starting piece valley, ridge and hip piece.
"How to Lay Illinois Zinc Shingles." Leaflet. 8½ x 11 in. 4 pp. Illustrated. Instructions for making a roof of Illinois Zinc Shingles using zinc clad nails, zinc starting piece, hip, zinc valleys, zinc ridge and hip pieces.

Johns-Manville, Inc., Madison Ave. & 41st St., New York, N. Y.
Johns-Manville Building Materials. Book. 8½ x 11 in. 100 pp. Illustrated. A comprehensive catalog of various types of roofing for all forms of construction. Details of wall, floor and ceiling insulation; asbestos wood for fireproof construction; waterproofing, etc.
Johns-Manville Asbestos Shingles. Booklet. 8½ x 11 in. 24 pp. Illustrated. This booklet is profusely illustrated in colors, showing some very artistic blends of asbestos shingles with various types of architecture. Contains many valuable suggestions for the architect.

Ludowici-Celadon Company, 104 So. Michigan Ave., Chicago, Ill.
"Ancient" Tapered Mission Tiles. Leaflet. 8½ x 11 in. 4 pp. Illustrated. For architects who desire something out of the ordinary, this leaflet has been prepared. Describes briefly our "Ancient" Tapered Mission Tiles, hand-made, with full corners and designed to be applied with irregular exposures.

Ruberoid Co., The (formerly the Standard Paint Co.), 95 Madison Avenue, New York, N. Y.
Instructions for Laying Built-up Roofs. Booklet. 8½ x 11. in. Illustrated.
Rubberoid Strip-Shingle. Booklet. 3½ x 6¼ in. 16 pp. Illustrated in color.

United Alloy Steel Corporation, Canton, Ohio
Better Sheet Metal. 8½ x 11 in. 128 pages and cover. Illustrated. Shows the many uses of Toncan Metal with many pictures of buildings, names of architects, etc., also tables of weights and other useful specification data.

ROOFING MATERIALS

National Slate Association, 757 Drexel Bldg., Philadelphia, Pa.
"Slate; Consider its Uses." Booklet. 4 x 6½ in. 20 pages and cover. Illustrated. A review of the advantages of using slate for various purposes, chiefly for roofing where it renders invaluable service by reason of its indestructibility.

SAFETY TREADS

American Abrasive Metals Co., 50 Church St., New York, N. Y.
Bronzalum Anti-Slip Treads. Date sheet 8½ x 11 inches, illustrated. Explains the use of Bronzalum treads for door saddles, stair treads, etc. Carborundum Anti-Slip Tile Treads. Data sheet 8½ x 11 inches, illustrated. Explains and illustrates the use of Carborundum Tile for stairs, ramps, floors, etc.

Universal Safety Tread Co., 40 Court St., Boston, Mass.
The Universal Safety Metal Tread. Booklet. 8½ x 11 in. 16 pp. Illustrated. Describes Safety Treads, with lead inserts in steel base, suitable for use on iron, wood or concrete stairs. Also the flat type, with "Alundum" surface, as well as special ladder treads for ships, power-house and engine-room open string stairways.

SASH CHAIN

American Chain Company, Inc., Bridgeport, Conn.
American Sash Chain. Booklet. 3½ x 6 in. 8 pp. Illustrated. Describes and illustrates American Sash Chain and Sash Fixtures.

Smith & Egge Mfg. Co., The, Bridgeport, Conn.
Chain Catalog. 6 x 8½ in. 24 pp. Illustrated. Covers complete line of chains, hardware and specialties.

SASH CORD

Samson Cordage Works, Boston, Mass.
Catalog. 3½ x 6¼ in. 24 pp. Illustrated. Covers complete line of rope and cord.

Yale University
New Haven, Conn.

Lord & Taylor Department Store
New York City

Emergency Hospital
General Electric Company
Schenectady, N. Y.

Hotel Pennsylvania
New York City

Mt. Sinai Hospital
New York City

An Unusual Service for Architects

- Electro-Medical Apparatus
- First Aid Equipment
- Hospital Furniture
- Hospital and Surgical Sundries
  - —Enamelware
  - Glassware
  - Rubber Goods
- Hydro-Therapeutic Apparatus
- Instruments
  - —General Operating
  - Specialists
  - Surgical
- Invalid Conveniences
- Laboratory Equipment
- Operating Room Equipment
- Sanatorium Equipment
- Scientific Apparatus
- Sick Room Conveniences
- Sterilizers
  - —Bed Pan
  - Dressing
  - Instrument
  - Utensil
  - Water
- X-Ray Apparatus and Equipment

SINCE the business economy of the prompt treatment of injuries and illness has become generally recognized, architects are more often called upon to include emergency hospital facilities in their plans for industrial and public buildings.

The permanent equipment going into rooms of this sort requires special wiring and piping connections and many times special room arrangement.

The Kny-Scheerer Corporation now offers to architects through its Engineering Service Department consultation service on the arrangement, setting and installation of permanent hospital equipment.

Those who have in process of preparation plans for standard hospitals, department stores, schools, theatres, manufacturing plants or buildings of like nature are cordially invited to avail themselves of this service for which there is no charge

The KNY-SCHEERER Corp.
OF AMERICA

119 Seventh Avenue New York, N.Y.

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 98*

SCREENS

Athey Company, 6015 West 65th St., Chicago, Ill.
The Athey Perennial Window Shade. An accordian plaited window shade, made from translucent Herring bone woven Coutil cloth, which raises from the bottom and lowers from the top. It eliminates awnings, affords ventilation, can be dry cleaned and will wear indefinitely.

The Higgin Manufacturing Co., Newport, Ky.
Your Home Screened the Higgin Way. Booklet. 8½ x 11½ in. 13 pp. Illustrated in colors. Complete description of Higgin Screens, designed to meet every need.

SEWAGE DISPOSAL

Kewanee Private Utilities, 442 Franklin St., Kewanee, Ill.
Specification Sheets, 7¾ x 10¼ in. 40 pp. Illustrated. Detailed drawings and specifications covering water supply and sewage disposal systems.

SHEATHING

Bishopric Manufacturing Co., 103 Este Ave., Cincinnati, Ohio.
For All Time and Clime. Booklet. 6 x 9 in. 48 pp. Illustrated. Describing the use of Bishopric stucco base and Bishopric plaster base.

SLATE

National Slate Association, 757 Drexel Bldg., Philadelphia, Pa.
Consider Its Uses. Booklet. 4 x 6⅛ in. 20 pp. and cover. Illustrated. Detailed uses of slate profusely illustrated, covering roofing, structural, electrical, sanitary, flooring and other utilization of slate. Printed in two colors.

STAINS—See Paints, Varnishes, Wood Finishes

STEEL COMPARTMENTS

Henry Weis Mfg. Co., Atchison, Kan.
Catalog No. 11, 1923 Edition. 8½ x 11 in. 32 pp. Illustrated. Shows Toilet, Shower and Dressing room compartment, and Hospital Cubical installations in all types of buildings; describes "WEISTEEL" compartments in detail; gives complete specifications and suggested specifications for architects' use; includes blueprints of suggested layouts, lists of Standard sizes and units.

STEEL DRESSERS

Janes & Kirkland, 133-135 West 44th St., New York, N. Y.
The White House Line. Booklet. 7¾ x 5¼ in. 24 pp. Illustrated. Describes and illustrates in detail WHITE HOUSE Steel Dressers and some of the separate units. Also contains typical layout and list of some of our clients.
Photographs. 5½ x 3½ in. Views of actual installations in private residences, schools, etc., sent on request.

STONE, BUILDING

Harrison Granite Company, 200 Fifth Avenue, New York, N. Y.
Harrison Granite Company. Clientele. 3¾ x 8¾ in. 24 pp. Illustrated. A partial list of clients with illustrations of examples of monuments and mausoleums.

Indiana Limestone Quarrymen's Association, Box 766, Bedford, Indiana.
Volume 3, Series A-3. Standard Specifications for Cut Indiana Limestone work. 8½ x 11 in. 56 pp. Containing specifications and supplementary data relating to the best methods of specifying and using this stone all building purposes.
Vol. 1. Series B. Indiana Limestone Library. 6 x 9 in. 36 pp. Illustrated. Giving general information regarding Indiana Limestone, its physical characteristics, etc.
Vol. 27. Series B. Designs for Houses of Indiana Limestone. 8½ x 11 in. 32 pp. Illustrated. Being the best designs submitted in competition for a detached residence faced with Indiana Limestone conducted by **The Architectural Review.**
Vol. 4. Series B. Booklet. New Edition. 8½ x 11 in. 64 pp. Illustrated. Indiana Limestone as used in Banks.

Tompkins-Kiel Marble Company, 505 Fifth Ave., New York, N. Y.
Reproductions in natural colors of imported and domestic marbles and stone for interior and exterior uses.
Bulletins. 9¾ x 12¾ in. Illustrating buildings of various types in which Tompkins-Kiel Marble Company's imported and domestic marbles and stone have been used.

STORE FRONTS

Kawneer Co., The, Niles, Mich.
A Collection of Successful Designs. Catalog. 9¼ x 6½ in. 64 pp. Illustrated. Showing by use of drawings and photographs many types of Kawneer Solid Copper Store Fronts.

STUCCO

Bishopric Manufacturing Co., 103 Este Ave., Cincinnati, Ohio.
For All Time and Clime. Booklet. 6 x 9 in. 48 pp. Illustrated. Describing the use of Bishopric stucco base and Bishopric plaster base.

STUCCO BASES

Bishopric Manufacturing Co., 103 Este Ave., Cincinnati, Ohio.
Specifications and Working Details. Booklet. 7¾ x 10½ in. Illustrated. Contains plainly written instructions for the use of stucco, stucco base, plaster base and insulation base.

STUCCO, MAGNESITE

American Magnestone Corporation, Springfield, Ill.
Catalog. 13 pp. Describes the quality, beauty and strength of Magnestone.

Muller & Co., Franklyn R., Waukegan, Ill.
Everlastic Magnesite Stucco, Booklet. 8½ x 11 in.

TERRA COTTA

National Terra Cotta Society, 19 West 44th St., New York, N. Y.
Standard Specification for the Manufacture. 8½ x 11 in. 12 pages. Furnishing and Setting of Terra Cotta, consisting of complete detail Specification, Glossary of Terms Relating to Terra Cotta and Short Form Specification for incorporating in Architect's Specifications.

TERRA COTTA—Continued

Architectural Terra Cotta. Standard Construction. 10½ x 14 in. 72 plates of typical details showing the correct principles in the jointing, anchoring, bonding, etc. of terra cotta. Cloth bound.
Present Day Schools, 8½ x 11 in. 32 pages. Illustrating 42 examples of school architecture with article upon school building design by James O. Betelle, A. I. A.
Better Banks. 8½ x 11 in. 32 pages. Illustrating many banking buildings in terra cotta with an article on its use in bank design by Alfred C. Bossom, Architect.

Northwestern Terra Cotta Co., The, 2525 Clybourn Ave., Chicago, Ill.
Booklet. 8¼ x 11 in. 77 pp. Illustrated. Showing in a concise way the usefulness of terra cotta.

The New Jersey Terra Cotta Co., Singer Bldg., New York, N. Y.
Store Fronts in Architectural Terra Cotta. Booklet. 8½ x 11 in. 44 pp. Illustrated. Photographs, measured drawings, designs and illustrations of decorative motifs make up an interesting booklet which will be forwarded upon request.

THERMOSTATS—See Heating Equipment

TILE, FLOOR AND WALL

Associated Tile Manufacturers, The, Beaver Falls, Pa.
Basic Information. Booklet. 7½ x 10⅝ in. 24 pp. Illustrated. Ask for Booklet K-200.
A publication issued for architects, engineers and educators to acquaint them with methods of grading, derivation of sizes and shapes, variety of colors, kind of finishes, nomenclature and ingredients and processes insofar as they lead to a better understanding of the product and its uses.
Basic Specifications and Related Documents. Booklet. 7½ x 10⅝ in. 38 pp. Ask for Booklet K-200.
The Basic Specification proper gives in detail the procedure to be followed with respect to any kind of tile installation in connection with practically every type of construction. The Related Documents or work sheets are designed to call attention to optional application methods and materials.
Swimming Pools. Booklet. 8½ x 11 in. 32 pp. Illustrated. Issued for the use of architects and engineers as a handbook on swimming pools and their construction.
Bringing the Crowds to Your Market. Booklet. 8½ x 11 in. 16 pp. Illustrated in color. Shows use of tile for the modern sanitary market.

B. Mifflin Hood Brick Co., Atlanta, Ga.
Burned Clay Products. Booklet. 9½ x 12½ in. 47 pp. Illustrated. Shows different uses of brick, but presents particularly the various uses of quarried floor tile. Free to architects and engineers.

Stedman Products Company, South Braintree, Mass.
Six-page folder. 8½ x 10½ in. Illustrated in colors, giving complete description of Stedman Naturized Flooring, Tiles, Wainscoting, Sanitary Bases, Stair Treads, etc. Technical data, recommendations and special flooring service.

The Vitrolite Company, 133 W. Washington St., Chicago, Ill.
Toilet Partitions and Wainscoting. Booklet. 8½ x 11 in. 32 pp. Illustrated. States comprehensive facts about Vitrolite, its adaptability and advantages as a slab material for wainscoting and toilet partitions, wall and ceiling surfacing, etc. Installations shown, with blue prints and architects' specification data.
Thoughts of Home. Booklet. 8½ x 11 in. 32 pp. Illustrated. Describes and shows practical application of Vitrolite and the artistic and economical results possible in its use in the home, for bathrooms, kitchen, pantry, etc.

TILE, FLOOR AND WALL

The Associated Tile Manufacturers, Beaver Falls, Pa.
Ceramic Mosaic, Standardized Sheets and Patterns. Booklet. 10⅝ x 7½ in. 32 pages. Illustrated in color. Gives valuable data on standardizing of mosaic sheets and patterns.

TILE, HOLLOW

National Fire Proofing Co., 250 Federal St., Pittsburgh, Pa.
Standard Wall Construction Bulletin 174. 8½ x 11 in. 32 pp. Illustrated. A treatise on the subject of hollow tile wall construction.
Natco on the Farm. 8½ x 11 in. 38 pp. Illustrated. A treatise on the subject of fire safe and permanent farm building construction.
Natco Homes and Garages. Booklet. 7 x 10 in. 32 pp. Illustrated. Showing the use of Natco Hollow Tile for private residences.

VACUUM CLEANING APPARATUS

The Spencer Turbine Company, Hartford, Conn.
Vacuum Cleaning Apparatus for all purposes. Booklet. 32 pp. Illustrated. Complete information on product, showing prominent buildings equipped with this system.

VALVES

Crane Co., 836 S. Michigan Ave., Chicago, Ill.
No. 50 Steam Pocket Catalog. 4 x 6½ in. 775 pp. Illustrated. Describes the complete line of the Crane Co.

Gorton & Lidgerwood Co., 96 Liberty St., New York, N. Y.
Gorton Quarter-Turn Packing-Lock Valves. Booklet. 4¼ x 7¼ in. 32 pp. Illustrated. Describing a new type of valve for all systems of steam, hot water and vacuum heating.

Illinois Engineering Co., Racine Ave., at 21st St., Chicago, Ill.
Catalogue. 8½ x 11 in. 88 pp. Illustrated.

Jenkins Bros., 80 White Street, New York.
The Valve Behind a Good Heating System. Booklet 4½ x 7¼ in. 16 pp. Color plates. Description of Jenkins Radiator Valves for steam and hot water, and brass valves used as boiler connections.
Jenkins Valves for Plumbing Service. Booklet. 4½ x 7¼ in. 16 pp. Illustrated. Description of Jenkins Brass Globe, Angle Check and Gate Valves commonly used in home plumbing, and Iron Body Valves used for larger plumbing installations.

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS —*Continued from page 100*

VARNISH—See Paints, Stains, Varnishes

VENETIAN BLINDS

Burlington Venetian Blind Co., Burlington, Vt.
Venetian Blinds. Booklet. 4½ x 7½ in. 32 pp. Illustrated. Describes the "Burlington" Venetian blinds, method of operation, advantages of installation to obtain perfect control of light in the room.

VENTILATION

Clarage Fan Company, Kalamazoo, Mich.
Catalog No. 52. 8½ x 11 in. 84 pp. Illustrated. Describes Clarage Kalamazoo Multiblade Fans and Heaters for use in schools, churches, hospitals and industrial plants. Engineering data, capacity tables and dimensions included.

WALL BOARDS

Carey Co., The Philip, Cincinnati, Ohio.
Carey Board for Better Building. Catalog. 6 x 9 in. 32 pp. Illustrated.

WARDROBES

W. L. Evans, 700 Block E, Washington, Ind.
Pictures That Talk. Catalog. 8½ x 11 in. 16 pp. Illustrated. Wardrobes, in units, with Evans Vanishing Doors, for schools, hospitals, hotels, office buildings and homes.

The J. G. Wilson Corporation, 11 East 36th St., New York, N. Y.
Catalog. 8½ x 11 in. 20 pp. Illustrated. Photographs and plans with dimensions for architects' use.

WASTE RECEPTACLES

Cortes Ward Company, Inc., 245 West 55th St., New York, N. Y.
Waste Receptacles. Catalogue contains complete illustrations and specifications of the different uses of Solar Self Closing Receptacles.

WATER HEATERS

Ruud Manufacturing Co., Pittsburgh, Pa.
Ruud Gas Water Heaters. Bulletins in filing folder describing instantaneous automatic water heaters for small homes and special uses, multi-coil automatic storage systems, automatic storage systems and tank water heaters. Details for connections, hot water service and specifications. 19 pp. Illustrated. 8½ x 11 in.
Ruud Automatic Storage Systems. Catalog of automatic hot water storage systems for domestic, industrial and commercial uses. Details, capacities, dimensions and other data. 24 pp. Illustrated. 6 x 9 in.
Ruud Multi-Copper-Coil Automatic Storage Systems Catalog describing automatic hot water storage systems of large capacity for large residences, apartment buildings, hotels, hospitals, gymnasiums and factories. Details, capacities and dimensions for complete line. 32 pp. Illustrated. 6 x 9 in.

WATERPROOFING

The General Fireproofing Company, Youngstown, Ohio.
Waterproofing Series A 507-9. Booklet. 8½ x 11 in. 42 pp. Illustrated. Thoroughly covers subject of waterproofing concrete, wood and steel preservatives, dustproofing and hardening concrete floors, and accelerating the setting of concrete.

Ruberoid Co., The, 95 Madison Ave., New York.
Impervite. Circular. 8½ x 11 in. 4 pp. Illustrated. An integral water-proofing compound for concrete, stucco, cement, mortar, etc.

Sandusky Cement Co., Dept. F., Cleveland, Ohio.
Medusa Waterproofing. Booklet. 6¾ x 9 in. 38 pp. Illustrated.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York.
Pamphlet. 3¾ x 8¾ in. 8 pp. Explanation of waterproofing principles. Specifications for waterproofing walls, floors, swimming pools and treatment of concrete, stucco and mortar.

WATER PURIFIERS

Wallace & Tiernan Company, Newark, N. J.
Protecting N. Y. Water Supply. Booklet. 10 x 7 in. 24 pp. Illustrated. Describes the chlorinating equipment used for sterilizing N. Y. City water supply; also equipment suitable for sterilizing water supplies of municipalities, industrial plants, private residences, etc.

WATER SOFTENERS

Permutit Company, The, 440 Fourth Ave., New York, N. Y.
Permutit-Water softened to No (Zero) Hardness. Booklet. 8½ x 11 in. 32 pp. Describing the original Zeolite process of softening water to zero hardness. An essential for homes, hotels, apartment houses, swimming pools, laundries, textile mills, paper mills, ice plants, etc., in hard water districts.

WEATHER STRIPS

Athey Company, 6015 West 65th St., Chicago, Ill.
Athey Cloth Lined Metal Weatherstrip. A metal weatherstrip, the rib running in a cloth-lined zinc channel, a perfect seal for the window, resisting all drafts and dirt, making a silent guide for the sash. Two years savings in fuel pays cost of installation.

Monarch Metal Products Co., 5000 Penrose St., St. Louis, Mo.
Monarch Metal Weatherstrips, A. I. A. Class 19 e 14. Manual. 7½ x 10¾ in. 48 pp. Illus. Designed for architects and specification writers, showing details of windows, doors and other openings and the proper manner of installing Monarch strips. It also shows various strips made by this company. Fourteen pages are devoted to window leakage and radiation calculations.

The Higgin Manufacturing Co., Newport, Ky.
Higgin All-Metal Weather Strips. Booklet. 6 x 9 in. 12 pp. Illustrated in colors. Describes various types of Higgin Weather Strips for sealing windows and doors against cold and dust.

WINDOW HARDWARE, CASEMENT

Hoffman Mfg. Co., Andrew, 900 Steger Bldg., Chicago, Ill.
Hoffman Casement Fixtures. Architects' Portfolio. 8½ x 11 in. 30 pp. Loose-leaf. Scale details for mill-work, installation, etc., in new and old work.

Monarch Metal Products Co., 5000 Penrose St., St. Louis, Mo.
Monarch Casement Hardware. A. I. A. Class 27 c 2. Manual. 7½ x 10¾ in. 20 pp. Shows details of casement windows and manner of installing Monarch casement hardware, for both outswinging and inswinging types. Monarch control locks are designed for installation under sill and to operate outswinging casements without removing screens.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Casement Window Hardware. Booklet. 24 pp. 8½ x 11 in. Illustrated. Shows typical installations, detail drawings, construction details, blue-prints if desired. Describes AiR-Way Multifold Window hardware.

WINDOWS, CASEMENT

Crittall Casement Window Co., 10951 Hearn Ave., Detroit, Mich.
Catalog No. 22. 9 x 12 in. 76 pp. Illustrated. Photographs of actual work accompanied by scale details for casements and composite steel windows for banks, office buildings, hospitals and residences.

Hoffman Mfg. Co., Andrew, 900 Steger Bldg., Chicago, Ill.
Hoffman Casements. Architects' Portfolio. 8½ x 11 in. 30 pp. Looseleaf. Scale details for mill-work, installation, etc., in new and old work.

Hope & Sons, Henry, 103 Park Avenue, New York.
Catalog. 12¼ x 18½ in. 30 pp. Illustrated. Full size details of outward and inward opening casements.

David Lupton's Sons Co., Allegheny Ave., and Tulip St., Philadelphia, Pa.
Casements and Double Hung Windows. Catalog. 8½ x 11 in. 44 pp. Illustrated. Shows new Lupton Casements and Double Hung Windows, with profuse illustrations and full details.

WINDOWS, STEEL AND BRONZE

Detroit Steel Products Company, Detroit, Mich.
Fenestra Basement Windows. Booklet. 3⅝ x 6¼ in. 16 pp. Illustrated. Describes steel basement windows, their advantages, details and specifications for installation.
Fenestra Reversible Ventilator Windows. Booklet. 8½ x 11 in. 20 pp. Illustrated. Describes the details of this new model window, as well as the variety it offers for attractive architectural design.
Fenestra Counter-Balanced Windows. Catalog. 8½ x 11 in. 111 pp. Illustrated. Details and specifications are thoroughly covered in the Fenestra General Catalog.
Fenestra Industrial Window Walls. Catalog. 8½ x 11 in. 111 pp. Illustrated. Details and specifications, with photographic illustrations, are thoroughly covered in the Fenestra General Catalog.

The Kawneer Company, Niles, Mich.
Kawneer Simplex Windows. Catalog. 8½ x 10½ in. 16 pp. Illustrated. Complete information, with measured details, of Kawneer Simplex Weightless Reversible Window Fixtures, made of solid bronze. Shows installations in residences and buildings of all sorts.
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David Lupton's Sons Co., Allegheny Ave. and Tulip St., Philadelphia, Pa.
Lupton Service—Products No. 11. Book. 8½ x 11 in. 192 pp. Illustrated. The full line of Lupton products described and illustrated. Separate chapter on Designing Service. Many new types of steel sash for apartments, hotels, etc., shown.
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Truscon Steel Company, 250 W. Lafayette Blvd., Detroit, Mich.
Truscon Steel Windows. Catalog. 8½ x 11 in. 80 pp. Illustrated. Contains complete data on all types of Truscon Steel Windows.

WOOD—See also Millwork

American Walnut Mfrs. Association, 618 So. Michigan Blvd., Chicago, Ill.
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Curtis Companies Service Bureau, Clinton, Iowa.
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Pacific Lumber Company, 332 So. Michigan Ave., Chicago, Ill.
California Redwood. Booklet. 9 x 12 in. 36 pp. Illustrated. Describes in a general way the production, manufacture and various uses of California Redwood.
Redwood Construction Digest. Booklet. 8½ x 11 in. 16 pp. Illustrated. Redwood and Its Uses in the Construction Field. Contains specifications and other information of interest to architects and builders generally.

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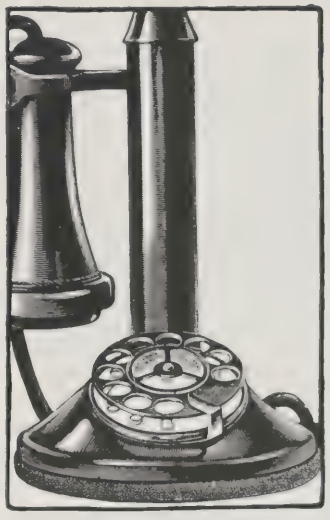

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Cincinnati, 827 Union Central Bldg.
Detroit, 525 Ford Bldg.
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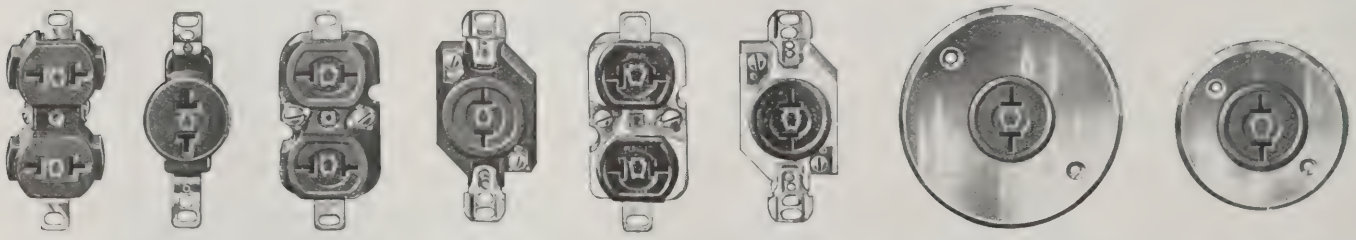

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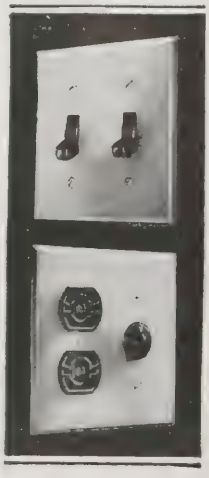

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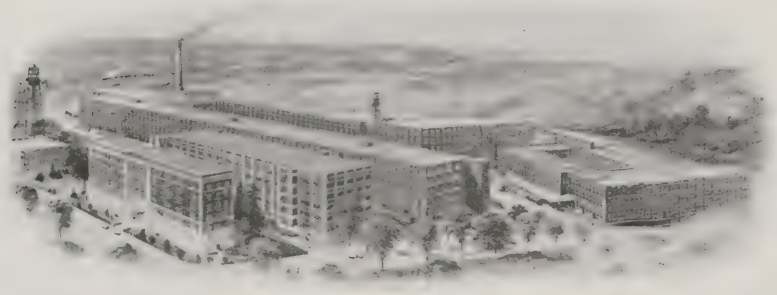

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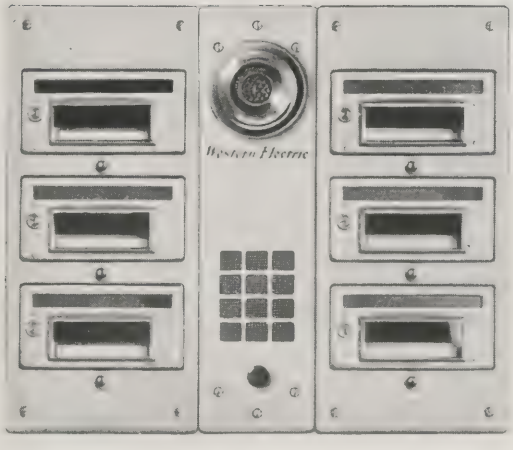

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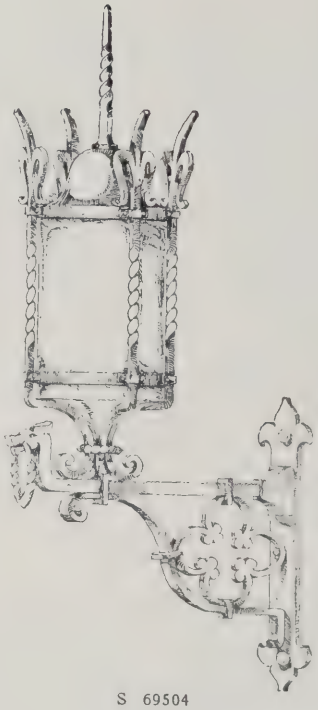

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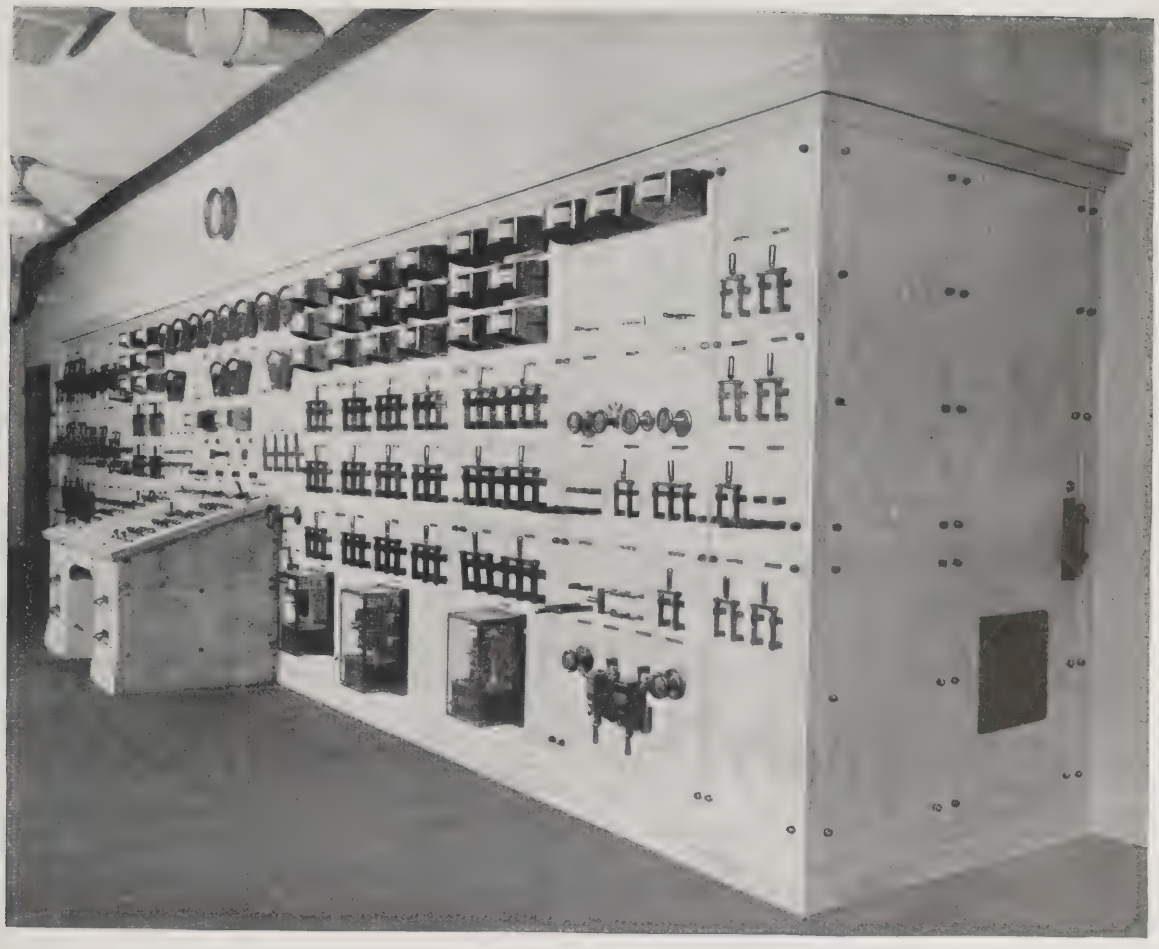

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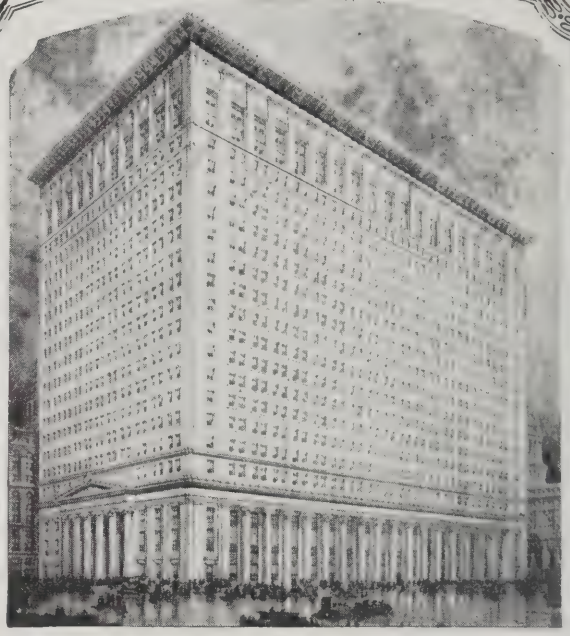

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COVE REFLECTORS

Our Engineering Department is co-operating with the leading architects in laying out and designing the lighting of prominent buildings throughout the country. We hope we can be of service to you.

"Specify Frink Reflectors"

I.P. FRINK, Inc.

24th St. and 10th Ave., New York

CHICAGO, ILL. Monadnock Bldg.	SAN FRANCISCO, CAL. 77 O'Farrell Street	PHILADELPHIA, PA. Franklin Trust Bldg.
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BIRMINGHAM, ALA.
426 Jefferson Co. Bk. Bldg.

CANADA
Associated with Robert Mitchell Co., Ltd.
64 Belair Ave., MONTREAL

The 4 Major Problems of Ash Removal—

the G&G ELECTRIC Telescopic Hoist
With Automatic Stop and Gravity Lowering Device

THE responsibility of selecting proper equipment for ash removal rests with the specification writer. As an aid to the large group of specification writers who have occasion to specify G&G Ash Removal Equipment, we publish the four general classifications covering ash removal—and the proper G&G Telescopic Hoist Equipment to do the work. Where there is a special problem involving an unusual combination of conditions, ask us to help you select the proper model.

the G&G Telescopic Hoist
with Automatic Gear Shifting Brake Device and Silencer

PROBLEM No. 1

Small volume of ashes (about 6 cans daily)
Short distance of lift (about 10 feet)
Hoistway opening against side of building.

SOLUTION

SPECIFY a Model A G&G Telescopic Hoist operated by hand power. Hoisting head revolves on ball bearings and can is deposited on pavement clear of hoistway without tilting or spilling of ashes. Empty cans are lowered by gravity under control of power band brake with brake lining. One man can easily perform the entire operation of ash removal. Operator exerts a pressure of only 12¼ lbs. in raising an average filled can weighing 175 lbs. at speed of 30 feet a minute.

PROBLEM No. 2

Small volume of ashes (about 6 cans daily)
Short distance of lift (about 10 feet)
Hoistway opening near curb or in driveway

SOLUTION

SPECIFY a Model B G&G Telescopic Hoist with Overhead Crane, operated by hand power. Ashes are dumped directly into wagon without rehandling cans at grade level. One man can easily perform the entire operation of ash removal. The Hoist occupies little space and when not in use no part shows above grade. Filled cans are raised at a speed of 30 ft. a minute and hoisting pressure of only 12¼ lbs. is required for the average can weighing 175 lbs.

PROBLEM No. 3

Large volume of ashes (more than 15 cans daily)
Deep hoisting area (15 feet or more)
Hoistway opening against side of building.

SOLUTION

SPECIFY a Model E G&G Telescopic Hoist electrically operated. This Hoist is built for heavy continuous duty and tests have proven it to be astonishingly economical in current consumption. While a large volume of ashes might make it desirable to employ more than one man, Hoist can be practically operated by one man and is therefore a labor saver. Loads up to 500 lbs. are raised at a speed of 60 ft. a minute and are lowered by gravity.

PROBLEM No. 4

Large volume of ashes (more than 15 cans daily)
Deep hoisting area (15 feet or more)
Hoistway opening near curb or in driveway

SOLUTION

SPECIFY a Model D G&G Telescopic Hoist electrically operated. This Hoist has the Overhead Crane feature which makes it possible to dump ashes directly into wagon without rehandling at grade. The motor is mounted near base of Hoist and two men can easily handle a large quantity of ashes. Loads up to 300 lbs. are raised at a speed of 60 ft. a minute. Surprisingly little current is used in operation of this Hoist.

Model A

Model B

Model E

Model D

And Keep This in Mind

The safety and labor-saving features built into these Hoists can be secured only by the installation of complete G&G Equipment (Hoist, Operator's Ladder, Swing Bail Hoisting Cans, Checkered Steel or Vault Light Sidewalk Doors, with Spring Guard Gates, Automatic Sidewalk Door Opening and Closing Device, Warning Gong and Ash Can Truck.)

Full description, illustrations, scale drawings and specifications in Sweet's, pages 2199-2207

GILLIS & GEOGHEGAN, 544 WEST BROADWAY NEW YORK CITY

Which?

SHALLO or SHALLOW

What might be shallow to an ocean liner would be quite deep enough for a canoe. Hence the word shallow might mean most any depth.

SHALLO, the name coined by the Arrow Electric Company, designates a complete line of flush devices with a definite limited dimension, one inch or less. This line contains every wall device that is desired, including the new single and duplex Convenience outlets for flush plates with or without doors, push button switches in single pole, double pole, three and four point with or without luminous button or lock, and Tumbler switches in the four styles with or without the Arrow "Glow-Tip". For your fall business you can save time and bother by using the "Shallo" line which is complete in all styles and is limited to one inch or less.

The Arrow Electric Company
HARTFORD, CONNECTICUT, U. S. A.

SHALLO MEANS

ELECTRICAL ARROW WIRING DEVICES

ARROW

The complete line of Wiring Devices

Carney, the cement perfected by forty years of experience, was used in the erection of the Churchill Apartments at Chicago, Illinois.
Architects: H. L. Stevens & Co., Chicago, Illinois.
Contractors: B-W. Construction Co., Chicago, Illinois.

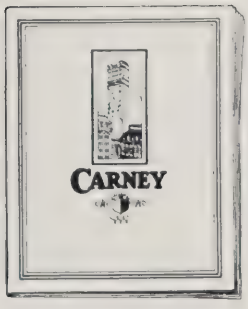
The Sale of Carney Steadily Increases

EXPERIENCE has shown architects and contractors generally that there is a great saving in building costs when Carney mortar is used. They also know from experience that Carney mortar builds a better wall. These facts have resulted in enormous increases in the sale of Carney. The increase in volume of our output is constant, regardless of business conditions.

Carney Has These Exclusive Merits

It requires no lime, assuring protection against adulteration or errors in mixing. Being more plastic and smoother working, the mason can work faster and easier on the wall. It lays the maximum number of brick to the barrel. It works perfectly in cold weather. It becomes harder than the brick and tile it binds, continuing to harden indefinitely as time goes on. It is ideal for wall bearing buildings. The final cost of a Carney wall is always lower. Contractors bid lower and do better work with Carney.

Carney is the perfected cement for brick and tile mortar.



This book tells the complete story of Carney. It will be sent free to anyone interested in building.

The Carney Company

Cement Makers Since 1883

Mankato, Minn.

Mills: Mankato, Minn., Carney, Minn.

District Sales Offices:
Leader-News Bldg., Cleveland; Chamber of Commerce Bldg., Chicago; Omaha National Bank Bldg., Omaha; Syndicate Trust Bldg., St. Louis; Book Bldg., Detroit; Builders' Exchange, Minneapolis.

CARNEY
for Brick and Tile Mortar

Specifications: 1 part Carney to 4 parts sand.
(due to refined process of manufacture.)

A few of the prominent buildings in Pittsburgh in which Banner was used

Schenley Apartments
Mellon National Bank Building
Exchange National Bank Building
Union Trust Building
Bell Telephone Building
Joseph Horne Building
West Penn Hospital Nurses Dormitory
William Penn Hotel
Chamber of Commerce Building

Banner

Finishing
Lime

The Thumb Test

There is one convincing method of proving certain important qualities of finishing lime.

It's the thumb test.

Simply place a small quantity of the lime on a smooth, hard surface and press it out with a short firm stroke of the thumb.

If it's Banner Finish you can detect immediately the absence of coarse undesirable grit.

You can feel it s velvety smoothness.

It's this quality of super-fineness that makes Banner the finish that is easy to spread.

Besides, it is snowy white and free from all impurities.

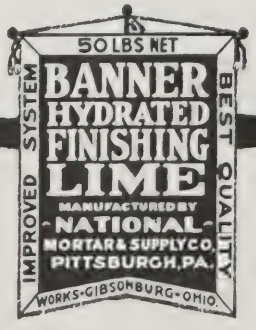
Make a thumb test of Banner yourself---we'll send you enough lime for the purpose if you'll just ask us for it.

National Mortar and Supply Company

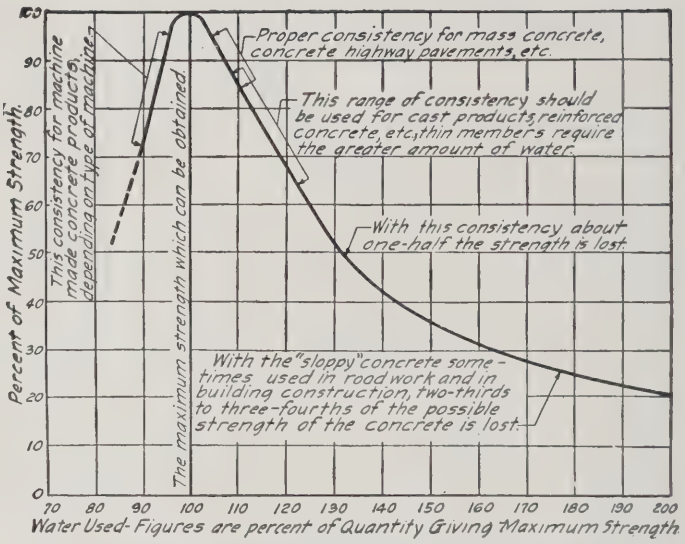
Federal Reserve Building

Pittsburgh, Pa.

Banner Finishing Lime



When One Pint of Water Wastes Two Pounds of Cement



Effect of Quantity of Mixing Water on the Compressive Strength of Concrete
NOTE: In general construction, the maximum strength can rarely be obtained, but it is possible to obtain 70 to 90 per cent of the maximum strength without additional expense by restricting the quantity of mixing water.

Observe this curve closely. It shows impressively the effect of the quantity of mixing water on the strength of concrete.

It is now known that excess mixing water, not only weakens concrete, but that it is actually wasteful of cement. One pint of water more than necessary in a one-bag batch decreases the strength and resistance to wear as much as though two or three pounds of cement were left out.

Here is a fact, which if brought home to the superintendent and the foreman, can be of great practical value in raising quality on the job.

Wouldn't you like to have, right at hand for quick reference, a practical manual which tells how the quantity of mixing water can be closely controlled, so as to give concrete greater strength without using any more cement?

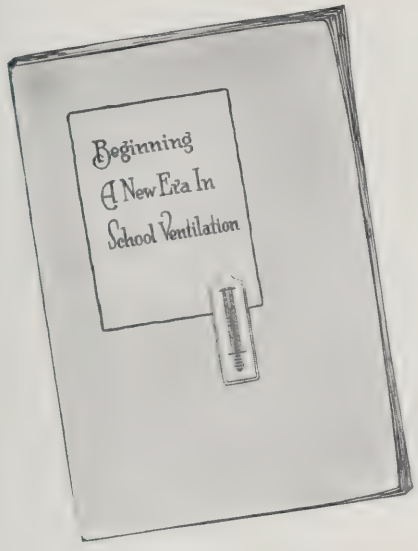
Then write today for our free booklet, "Concrete Data for Engineers and Architects." We will be glad to send you extra copies for superintendents and foremen.

Take full advantage of the service the Portland Cement Association has to offer. One of the District Offices of the Association is always near you. Get acquainted with it.

PORTLAND CEMENT ASSOCIATION

A National Organization
to Improve and Extend the Uses of Concrete

Atlanta	Denver	Kansas City	New York	San Francisco
Birmingham	Des Moines	Los Angeles	Parkersburg	Seattle
Boston	Detroit	Memphis	Philadelphia	St. Louis
Chicago	Helena	Milwaukee	Pittsburgh	Vancouver, B.C.
Dallas	Indianapolis	Minneapolis	Portland, Oreg.	Washington, D.C.
	Jacksonville	New Orleans	Salt Lake City	



This Is The Book

Do you know that before this book with its new teachings of ventilation could be written the whole theory of ventilation, as accepted to within the past few years, had to be proved unsound and antiquated.

A Book That Took Six Men Five Years to Write

HERE is a book that will take you fifteen minutes to read. But it will take you the rest of your life to forget what it says, because in fifteen minutes it will present to you an entirely new series of facts on a subject of vital importance to us all—room ventilation. The name of this book is "Beginning a New Era in School Ventilation."

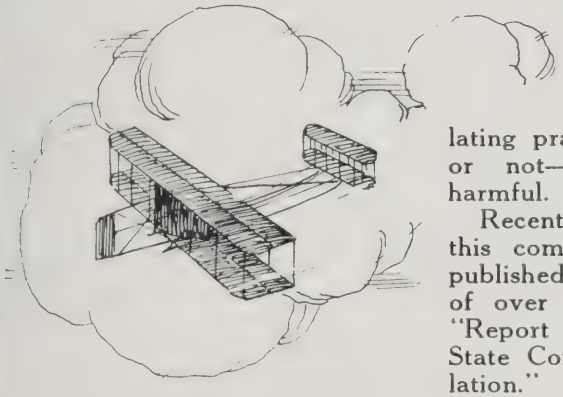
Ten years ago a commission of prominent scientists and engineers, financed by philanthropists and empowered by the State of New York, undertook an exhaustive and authoritative study with the idea of determining once and for all whether modern ventilating practice was adequate or not—health giving or harmful.

Recently the findings of this commission have been published in a huge volume of over 620 pages entitled "Report of the New York State Commission on Ventilation."

For the benefit of those of you who are interested in the subject of room ventilation, and who cannot take the time to go through the great mass of detail in the original, we have prepared a digest of it and call it "Beginning a New Era in School Ventilation."

In it you will find authentic, proven information of incalculable value and interest. Information so revolutionary that it upsets the whole structure of facts about room ventilation as practiced today—information so carefully studied and proven that it lifts the veil of mystery that has so long enshrouded the practice of ventilation—facts so clearly set forth and so easily applied that you can incorporate them in any work you now have in hand.

To a copy of "Beginning a New Era in School Ventilation" you are most welcome. Write us today.



Before the Wright brothers could teach the world to fly they first had to discard as useless, then reconstruct, the whole known science of air currents and forces.

AUSTRAL WINDOW COMPANY

What you want in a Window
you get in the

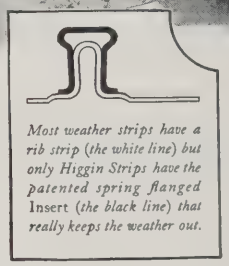
AUSTRAL WINDOW

Architects' Building
101 Park Ave., N. Y. City

Represented throughout
United States and Canada

HIGGIN
ALL METAL
WEATHER STRIPS

When winter tests the architect's service!



Most weather strips have a rib strip (the white line) but only Higgin Strips have the patented spring flanged Insert *(the black line) that really keeps the weather out.*

It is in the winter that a well-built home proves the reputation of the architect, and justifies its cost—if first-class design and honest construction are backed up by the most efficient weatherstrips obtainable.

Today architects are writing Higgin All-Metal Weatherstrips into their specifications to insure the client's satisfaction with his completed home. On windows and doors of every type Higgin All-Metal Weatherstrips have proved their efficiency by demonstration, tests and experience. They shut out drafts completely, maintaining a comfortable, uniform temperature with an actual saving of radiation and boiler capacity.

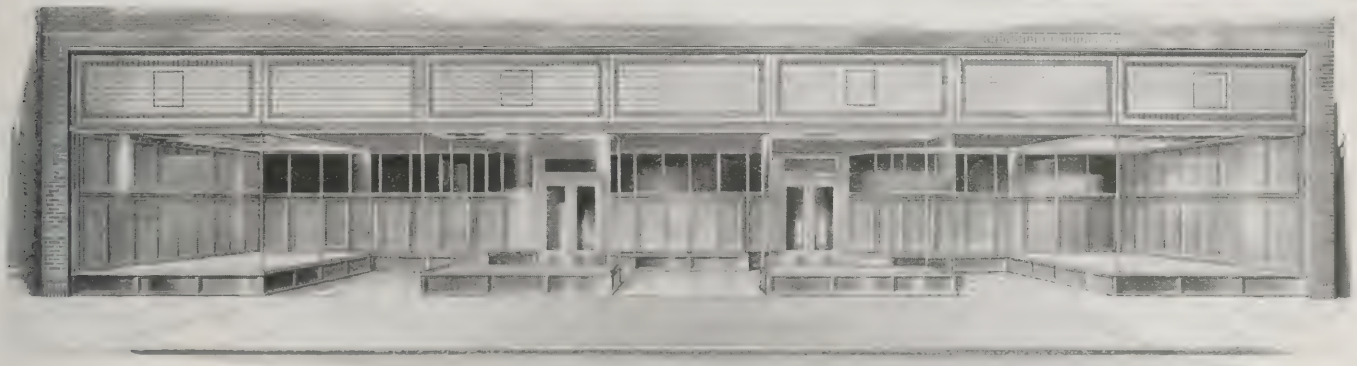
A Higgin service man is within call from your office. Your request will secure his personal cooperation in his specialty, and a crew of trained Higgin fitters will install the job. Higgin service is developed to fully protect the interests of yourself, your client, and Higgin reputation.

SEE OUR CATALOGUE IN SWEET'S

The HIGGIN Mfg. Co.
Newport, Ky.
Toronto, Canada.

Look in your telephone or city directory for the address of your local Higgin Service Office, or write the home office direct.

Manufacturers of Higgin All-Metal Weatherstrips and Higgin All-Metal Screens



Simplicity, Beauty and Quality

attained by using

Brasco Display Windows

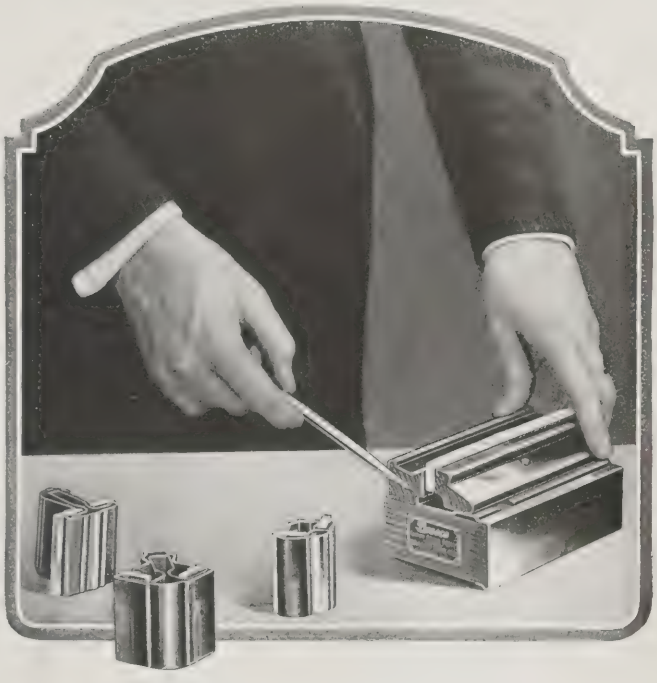
The Highest Standard Possible

INDIRECT screw pressure, great strength, glass safety, improved drainage, ease of installation, patented creosoted-wood core encased in heavy copper—these and other outstanding factors make possible the higher standard for store front construction established by Brasco.

To give the greatest ultimate satisfaction to your clients, to carry out your own ideas to the fullest extent and to assure best results in general, specify Brasco construction.

Write for catalog and detail sheets

BRASCO MFG. COMPANY
5031 South Wabash Avenue, Chicago, Ill



Every architect should have these sample sections of Brasco, showing the patented creosoted wood core construction. Sent promptly upon request.

Brasco

COPPER STORE FRONTS

Heavy Trucks Like This Cause Vibration

that smashes show windows—Unless—

the glass is perfectly set. You can be assured that the construction will be permanent on any work you specify if you see to it that the glass is set in

Zouri

SAFETY METAL

STORE FRONTS

The famous Zouri Key-Set construction positively prevents glass breakage because it brings the glass into firm and even contact with the full face of the rigid rabbet—always. Furthermore, the Murnane Self-Adjusting Setting Blocks—an exclusive Zouri feature—make prying the glass into place unnecessary.

Detailed specifications, scale drawings and the benefit of our long experience in store front design, construction and installation —yours to command.

There is a distributor near you who carries a full line of Zouri and International Store Fronts. Ask us for his name—no obligation.

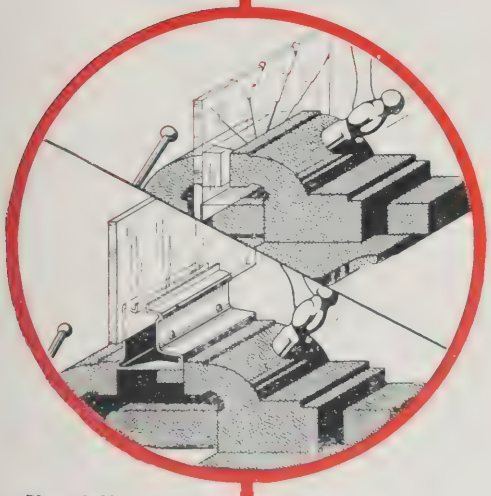
A typical Zouri store front installation

Zouri Drawn Metals Company

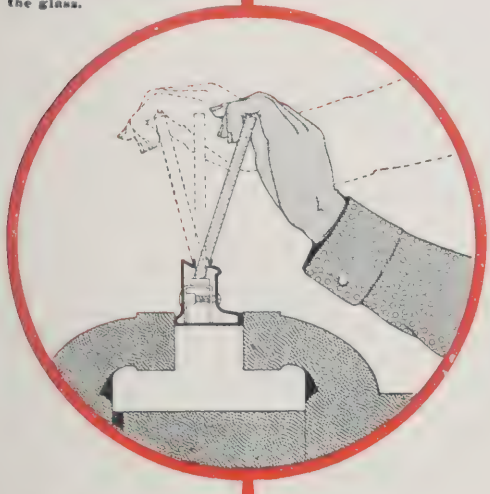
General Offices and Factory

1808 EAST END AVENUE **CHICAGO HEIGHTS, ILLINOIS**

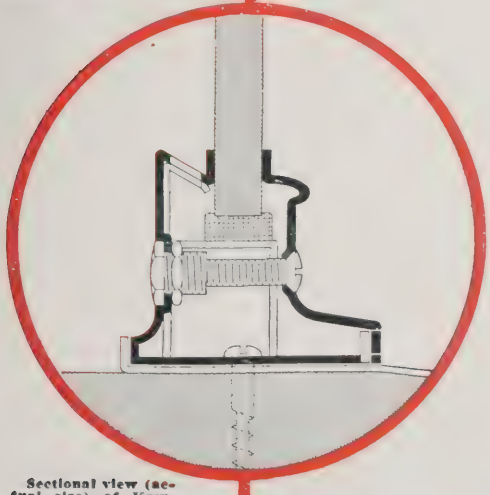
Kawneer
SOLID COPPER
STORE FRONTS



Glass held in a rigid vise is easily shattered by a slight blow. But when held in the resilient, spring grip of Kawneer Store Front Construction, vibrations do not affect the glass.



Because of the resilient grip, glass set in Kawneer Construction is free to rock on its own base when bowed under wind pressure.



Sectional view (actual size) of Kawneer Resilient Sash showing how rugged strength is combined with spring-like grip.

These tests show the essentials of a correct plate glass setting

Plate glass vibrates. It also bends.

Strike your knuckle against a large plate of glass and you will hear it vibrate. Watch it on a windy day and you can easily see the glass bend under wind pressure.

Plate glass is brittle. When it is held in a tight, rigid grip, vibrations from street cars, busses, etc. and bending under wind pressure frequently cause breakage.

Kawneer Resilient Store Front Construction holds glass between two spring faces so that the vibration waves pass out thru the edges of the glass in a natural way. This spring-like resiliency also permits the glass to rock on its base when bent under wind pressure, eliminating the danger of breakage.

This feature of resiliency has been proven successful in more than 260,000 Kawneer Store Fronts. You will find them on most business streets.

More than 60 Branch Offices and sales connections are prepared to give prompt service on architects requirements. Catalog and standard details sent promptly upon request.

THE Kawneer COMPANY
NILES MICHIGAN

Architect.
F. L. PACKARD,
Columbus,
Ohio

The Mansion of the Governor of Ohio, now occupied by Governor A. V. Donahey
A number 200 Ruud Multi-Coil Storage System connected to a 150 gallon galvanized tank assures a constant supply of ever-ready hot water.

Fifteen Governors' Homes are Ruud-Equipped

This is the Ruud Architect's Specification Folder. It fits your files as conveniently as its contents suit your plans. All data necessary to the specification of Ruud Gas Water Heaters is here in compact and workable form. Write for your copy.

THE Perfect Hot Water Service that Ruud Automatic Gas Water Heaters are providing in many Governors' residences is indicative of the hot water supply assured your clients when you specify RUUD.

In fifteen Governors' homes Ruud Automatic Gas Water Heaters furnish steaming, sizzling hot water—at the turn of a faucet—always hot—always enough.

You can specify RUUD for buildings of every size—large or small. In homes, hospitals, factories, hotels, clubs—wherever an abundant supply of hot water is desired, RUUD fills the need—automatically and inexpensively.

RUUD MANUFACTURING COMPANY
PITTSBURGH, PENNA
BRANCHES IN ALL LARGE CITIES

RUUD AUTOMATIC GAS WATER HEATERS

Middletown High School, Middletown, Ohio. Thomas D. McLaughlin, Architect, Lima, Ohio; Willing Bros. Construction Co., Bellevue, Ohio, Contractors. BRIXMENT used exclusively for mortar on both exterior and interior masonry.

The architect prescribed it, the contractor preferred it, the dealer pushed it

THIS was the condition, as applied to BRIXMENT, that prevailed when the final plans of the Middletown (Ohio) High School were completed. A similar condition exists wherever the unusual advantages of this standard mortar material are known. And why?

Naturally the architect is interested in any justifiable economy that can be effected on behalf of his clients; but he is even more concerned about those qualities that will insure the permanence and architectural correctness of his work. All these essentials he finds in BRIXMENT through exhaustive tests and the results of large-volume use.

To the contractor, especially today when he is confronted by excessive costs in other phases of his work, economy is a vital factor. In BRIXMENT he has discovered exceptional economies in time, labor, material and money.

It is to the dealer's interest to sell a product for which, because of certain exclusive advantages, there is a continuous and growing demand. The almost phenomenal increase in the use of BRIXMENT in foremost construction work throughout the country is tangible evidence of its complete fulfillment of the highest standards of practice—structural, architectural, economical.

No lime. No slaking. Can be used immediately after mixing (one part BRIXMENT; three parts sand).

Write for descriptive booklet and list of well-known buildings in which BRIXMENT has been used exclusively for mortar.

LOUISVILLE CEMENT COMPANY, *Incorporated*, LOUISVILLE, KENTUCKY

BRIXMENT ~ *for Perfect Mortar*

From the Famous White Rock District

TIGER FINISH comes from the famous White Rock District of Ohio where the lime rock deposit has certain natural physical qualities unequaled anywhere else in the world for making finishing hydrate. Nowhere else is lime made so plastic, so white, so ideal for finish work.

See Sweet's for full particulars about using TIGER FINISH—the lime which *"Spreads like warm butter."*

The Kelley Island Lime & Transport Co.
World's Largest Producer of Lime
Leader-News Building
CLEVELAND

Clyde Court Apartments
Miami, Florida

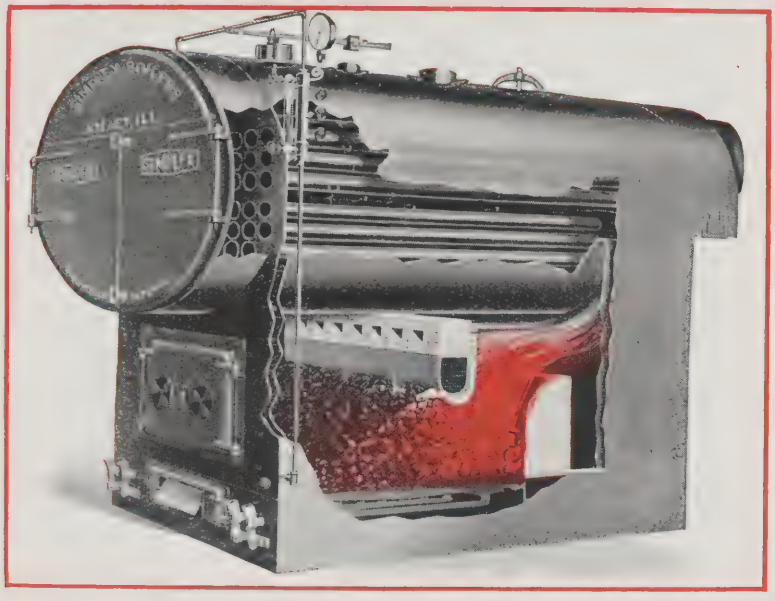
August Geiger
Architect

St. John Construction Company
General Contractors

John B. Orr
Plastering Contractor

TIGER FINISH supplied by
E. I. Schilling Co.

SIMPLEX BOILERS



A heating boiler of the latest approved type embodying utmost simplicity of design and construction with outstanding advantages in efficiency economy and convenience

Simplex Smokeless Steel Heating Boilers combine both fire box and double return tubular types into one. Built of extra heavy flange steel according to A. S. M. E. code; electric arc welded. Large heating surface and flue area, long fire and gas travel. Complete wall of water, with absolutely free circulation. Come all in one piece (except base)—easily and quickly set up without rivets or brick work to leak air and spoil fire control. Built in all sizes for *steam or hot water*. Burn any kind of coal smokelessly; especially efficient with oil; also burn gas or wood. Save 25% to 40% fuel. Compact and economical of floor space. All flues cleaned from the front; smoke connection in rear. Accurately rated, and guaranteed—known wherever used for the ease with which they maintain required temperature in all weathers.

Simplex Water Heating Garbage Burners afford the same advantages in design, construction and efficiency.

For full description, illustrations, drawings and specifications, write our general sales offices.

HEGGIE SIMPLEX BOILER COMPANY, JOLIET, ILL.

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SIMPLEX

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Cleveland, Ohio
J. R. Furth
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SIMPLEX SMOKELESS STEEL HEATING BOILERS

STEDMAN as used in the Hotel Sinton Cincinnati, Ohio

It looks like marble, feels like velvet, wears like iron

In These Buildings You Will Find
STEDMAN
Naturized Reinforced Rubber
FLOORING

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First National Bank, Detroit, Mich.
Merchant's National Bank, Boston, Mass.
North River Savings Bank, New York City

BUSINESS OFFICES
Crane Co., Chicago, Ill.
McKim, Mead & White, New York City
Stetson Shoe Co., South Weymouth, Mass.

CHURCHES
Central Presbyterian Church, New York City
St. Gregory's Church, Philadelphia, Pa.
St. Paul's Church, Cambridge, Mass.

CLUBS
Knollwood Country Club, Elmsford, N. Y.
Union League Club, New York City
Chicago Athletic Club, Chicago, Ill.
Grosse Point Country Club, Detroit, Mich.

HOSPITALS
Baylor Hospital, Dallas, Texas
Boston Lying-In Hospital, Boston, Mass.
Fifth Avenue Hospital, New York City
Mount Sinai, Cleveland, Ohio
Royal Victoria Hospital, Montreal, Can.

HOTELS
Astor Hotel, New York City
Biltmore Hotel, Providence, R. I.
Jefferson Hotel, St. Louis, Mo.
Sinton Hotel, Cincinnati, Ohio

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RESIDENCES
Many of the most exclusive in the country

SCHOOLS AND COLLEGES
Bristol High School, Bristol, Conn.
Boston Latin School, Boston, Mass.

STORES
B. Altman & Co., New York City
La Salle & Koch Co., Toledo, Ohio
R. H. White Co., Boston, Mass.

Good Buildings Deserve Good Flooring

FOR the same reason that Stedman Naturized Flooring has been judged almost indispensable to really modern hotel or hospital buildings, it is excellent for any modern building—banks, clubs, department stores.

Absolutely silent—it absorbs other noises. Sanitary, hard to soil and easy to keep clean. Won't cut, dent, crack or break. Won't stain; impervious to the common flooring enemies. Pleasant to walk on; gives a firm resilient footing.

To say that Stedman can always take the place of marble, would be a misstatement. But to say that marble is always better than Stedman, would be even more untrue. When you want a *combination of the best qualities of marble and rubber*—specify Stedman Naturized Flooring.

Stedman Naturized Flooring is rubber, reinforced and held together with an infinite cobweb of minute gossamer cotton fibres, vulcanized under terrific hydraulic pressure. Made in marble, granite and tapestry effects—in tiles, square and rectangular, in long runners—browns, reds, grays, black—in all the formal splendor of a classic floor, or in an intimate blend of cozy warm mixtures in Nature's own colorings.

Let us send you complete data and samples. To facilitate architectural specification, we are advertising this flooring directly to home owners, hotel operators, bankers, hospital managements, school boards, and superintendents

STEDMAN PRODUCTS COMPANY

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"At the sign of the Blue Boar"

From a painting by E. Croft, R.A.

"THE spurred boots of Cromwell's Roundheads rang lustily upon the Blue Boar's' time-worn tiles." Sturdy indeed must have been the floors of these ancient hostelries to withstand the continued traffic of men at arms. The inn-keeper of the 17th Century chose his floors, if choice there was, for their durability. Decorative effect and comfort played but small part in hotel architecture of that period.

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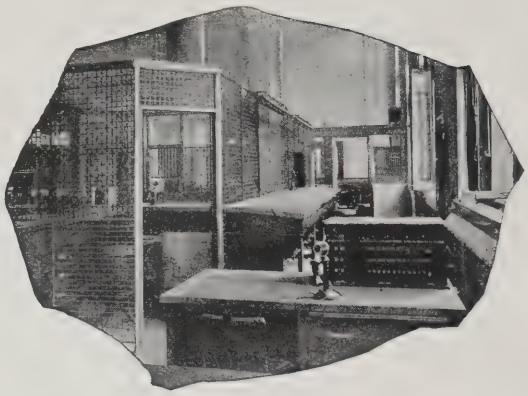

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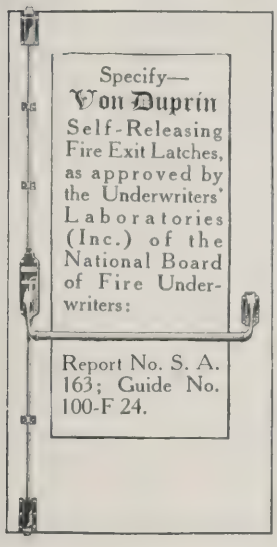

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WHILE the sash pulleys are one of the smallest items in the total cost of a building, they nevertheless affect the operation of the windows throughout the entire life of the sash in which they are used.

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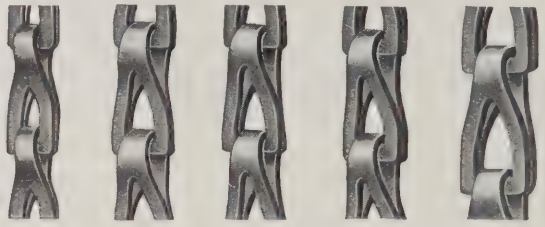

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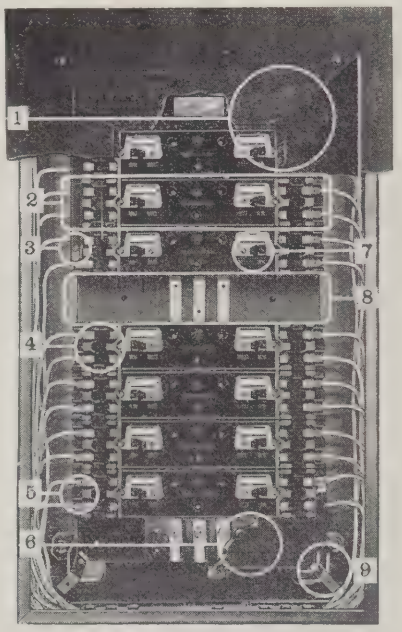

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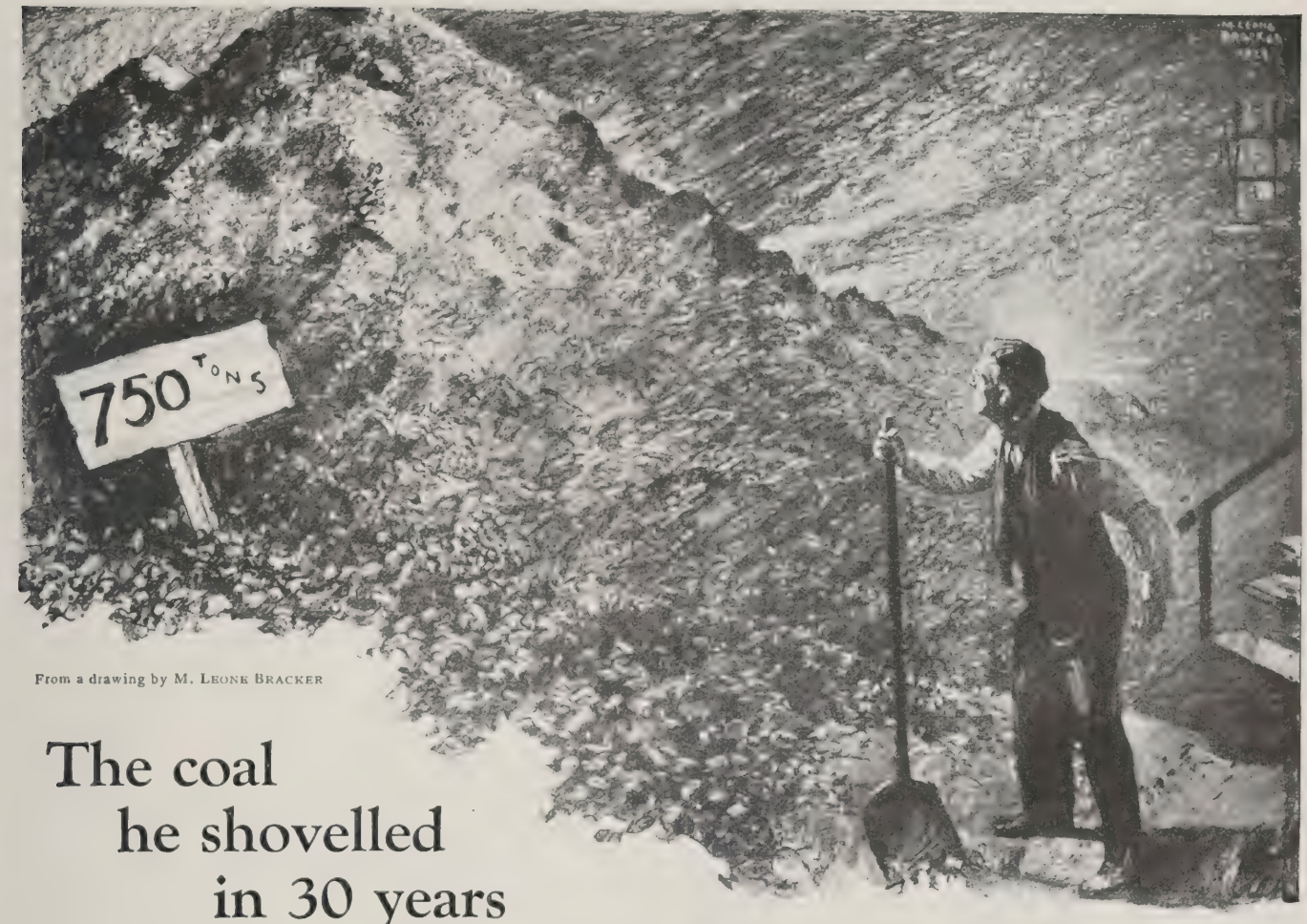

From a drawing by M. LEONE BRACKER

The coal he shovelled in 30 years

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—*a true story for Architects and Heating Engineers*

LET US tell you the story of a home-owner in Evanston, Illinois.

He has had an IDEAL Boiler in his cellar for thirty years; it cost him new, about $275 (without radiators and piping).

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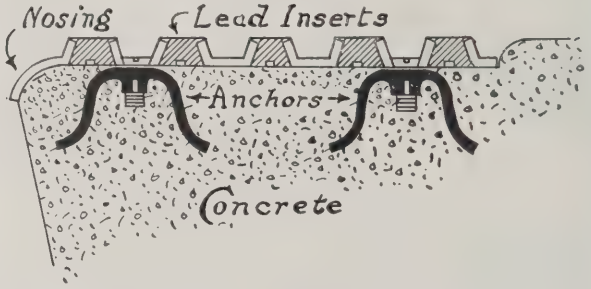
FOR CONCRETE STAIRS



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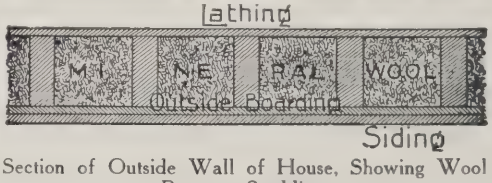

Section of Outside Wall of House, Showing Wool Between Studding

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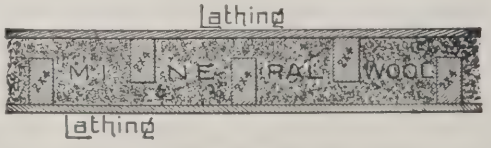
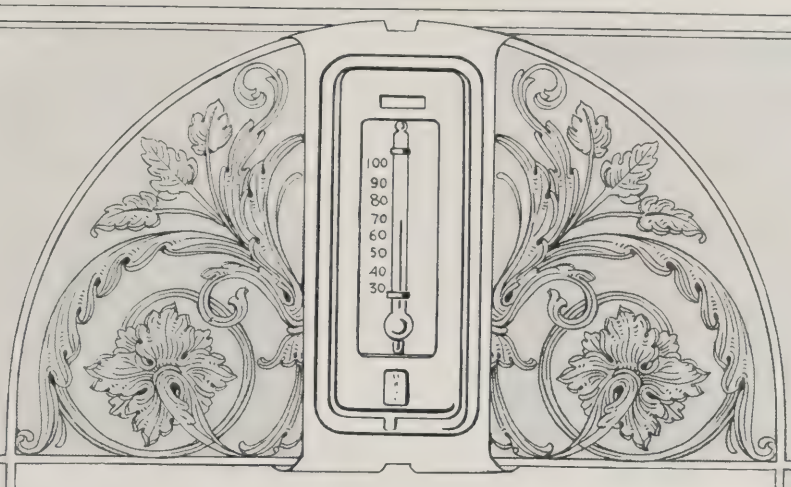


Section of Sound-Proof and Fire-Proof Partition



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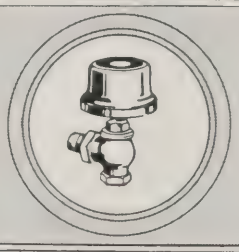
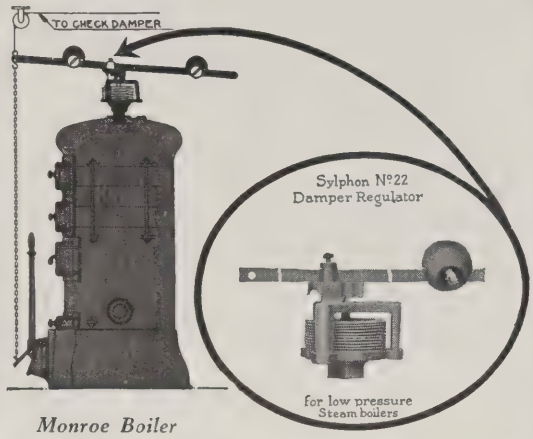


As installed in hundreds of thousands of heating systems in the past 15 years.



Monroe Boiler

Standard Equipment on all these steam boilers

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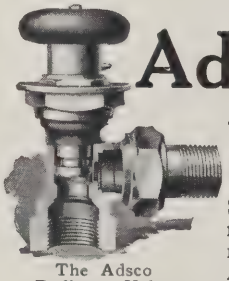

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"LIVE OUTDOORS-INDOORS"
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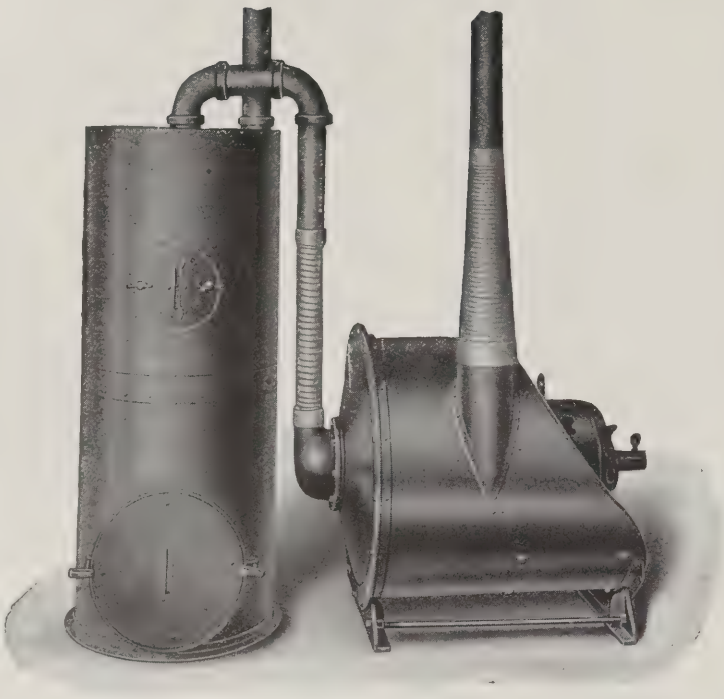

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This means that an architect can specify Clarage Fans for any system, simple or intricate, large or small, with full assurance that the equipment recommended by the Clarage engineering staff will give maximum efficiency and be backed by the cooperation of an organization which has covered every phase of fan application.

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Catalog 52 describes in detail heating, cooling, ventilating and humidifying systems of every type and contains complete dimensions, layouts and capacity tables covering the fans illustrated here. It should be in every architect's library. Have you your copy?

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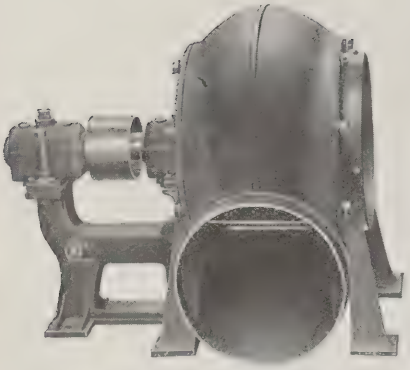

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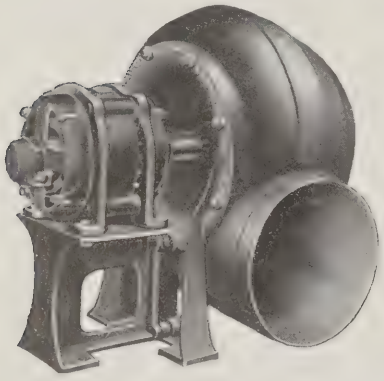
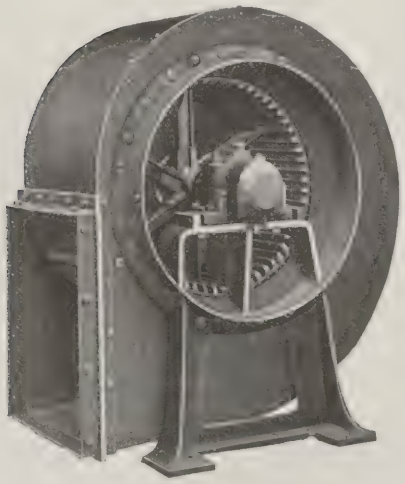
Sizes ¼ to 1¼ for belt drive. Equipped with Clarage Standard Bearings.



Motor Driven, Compact, for Bank Vaults, Booths, Etc.

Sizes ¼ to 1¼ direct motor driven. For range of service similar to small belt driven fan illustrated above.



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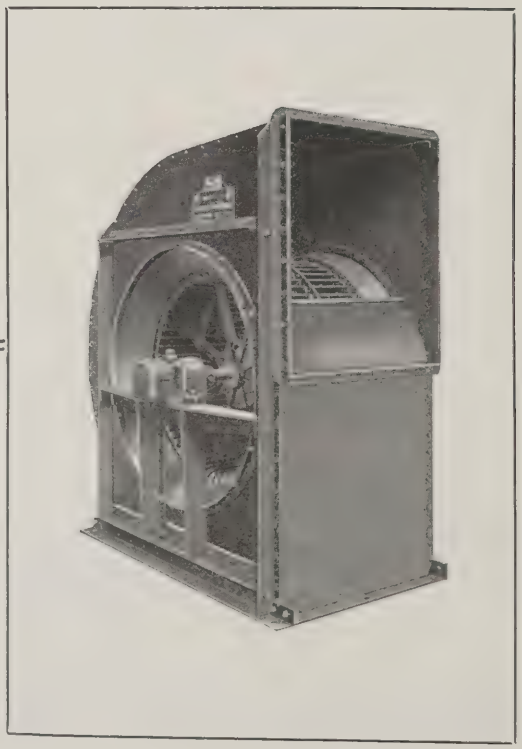
Sizes 1¼ to 3, belt driven. Made single width as shown or double width; also built as a double fan—an exclusive Clarage arrangement.



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Large Multiblade, size 3½ and larger. Used with air washers and heaters. Belt driven; direct driven by slow speed motor; or direct connected to Clarage Engine.

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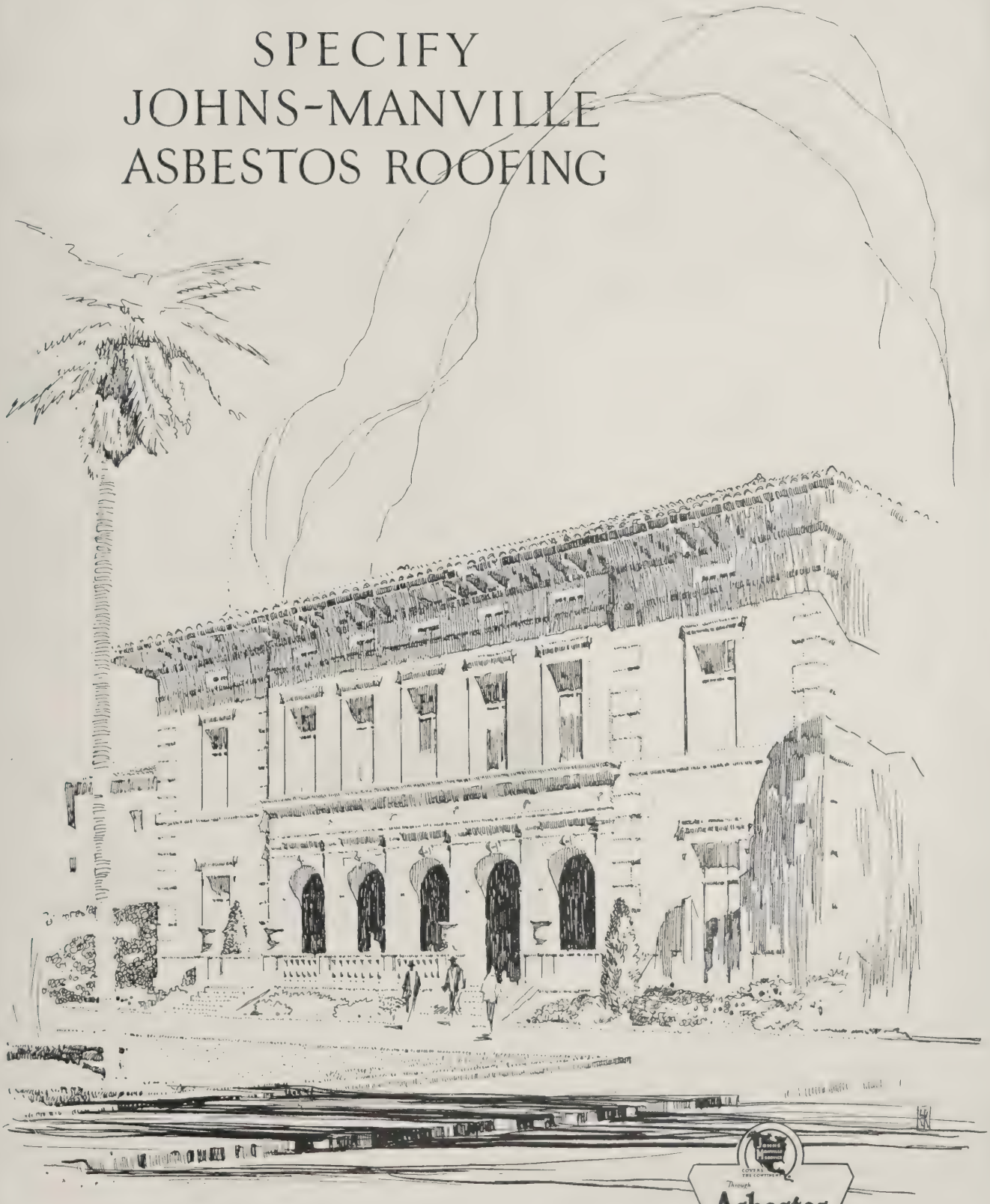

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Illinois Vapor Systems are positive and rapid in circulation, and the temperature of each room is within easy control of the occupant, as only a half turn of the Supply Valve is required from full steam to shut off.

With these desirable results, ***Illinois Systems*** combine some features which effect an exclusive fuel economy—Our Bulletin No. 21 describes this apparatus. Sent upon request.

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In the Home Admired—

Below is shown the convenient Kernerator hopper door, through which all waste matter is dropped to the brick combustion chamber in the basement. Dries the matter by forced draft, allowing quick combustion when lighted.

THE KERNERATOR, because it is the time-tried, accepted solution to the problem of garbage and waste disposal, is becoming more and more the standard equipment of better-class homes.

Built in the chimney, it handles *all* household refuse, reducing everything combustible to ashes and sterilizing all non-combustibles for easy removal with the ashes. Costs nothing to operate, as the waste itself is all the fuel required.

Full details on Pages 2340-41, Sweet's (1923), or write

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KERNERATOR
Built-in-the-Chimney
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How to Plan Efficient Dishwashing Installations

WHEN you draw plans for kitchens in clubs, restaurants, hotels, hospitals, institutions, these booklets will come in right handily. They provide not only for finer-looking kitchens but—more important—more efficient kitchens, with dishwashing equipment that is 100 per cent economical.

Autosan equipment will cut dishwashing payrolls in half, breakage costs 60 per cent, will quickly pay its own cost in the saving it effects, and will endure for years.

Consider Autosan equipment well before you draw kitchen plans. Let us first send these four booklets for your perusal.

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DISH AND SILVER CLEANING MACHINE

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can be disposed of in any hotel, restaurant, hospital, apartment, residence or industrial plant equipped with a Goder Incinerator of the right size and type. Installation is possible whether building is old, new or in plan.

Malodors are completely eliminated. Storage of garbage is unnecessary. Operation costs not only low but almost if not entirely offset by use as hot water plant. Soundness of material and construction insures against breakdown.

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WASTE DISPOSAL
GODER
FURNACES

The Garbage Hog

The illustration below is the new standardized type of Goder Incinerator intended for small and medium sized installations where the requirements for waste disposal range only from 2 to 20 cans per day. It is shipped knocked down but in such form that it can be assembled like any ordinary stove or furnace and easily set up by local furnace men. Flue connection with chimney.

Ivanhoe Masonic Temple, Kansas City, Mo.
Architects, Smith Rea and Lovett.

The Shining Symbol of Cleanliness

SYMBOLS show themselves in many different parts of beautiful Ivanhoe Temple. Most of them are Masonic, but in the kitchen, Monel Metal appears as the symbol of cleanliness.

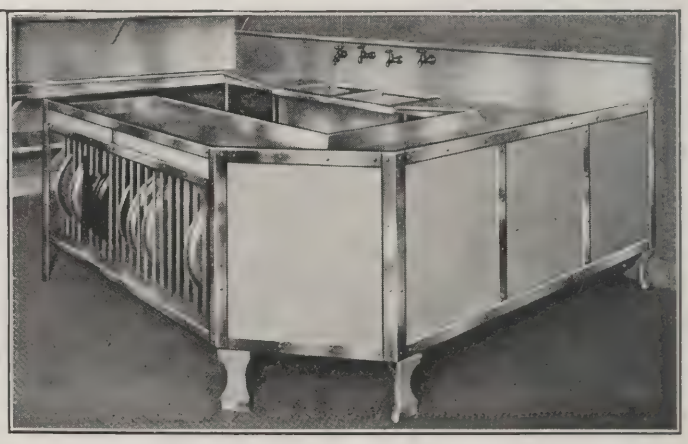
Monel Metal is inherently clean. It never rusts—it resists corrosion—a little soap and water quickly restore its original brightness. The strength of Monel Metal is noteworthy. It outlives other metals under hard usage. The resulting long life and the ease with which it is kept clean make Monel Metal ideal for kitchen equipment.

Monel Metal serves many varied and useful purposes in building construction and equipment. You should know more about it. Write for literature showing typical installations.

The INTERNATIONAL NICKEL COMPANY, 67 Wall St., New York City

Producers also of Malleable Nickel in Sheet, Rod and other commercial forms.

Monel Metal steam tables, dish warmers and tray slides. All equipment made and installed by **CHARLES ZEHN & SON MANUFACTURING CO.,** *Kansas City, Mo.*



Monel Metal dish counter, manufactured by **CHARLES ZEHN & SON MANUFACTURING CO.,** *Kansas City, Mo.*

INCo Monel metal

Van Equipment—

for the preparation and serving of food

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This reputation has been maintained over a period of 75 years. During that time we have had occasion to solve nearly every problem that has to do with kitchen and dining room installation.

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Culinary appliances supplied by Van.

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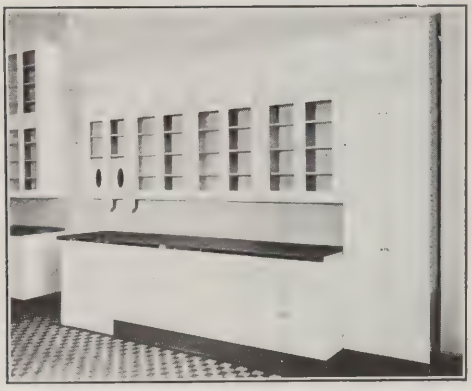
SECTIONAL UNIT STEEL DRESSERS



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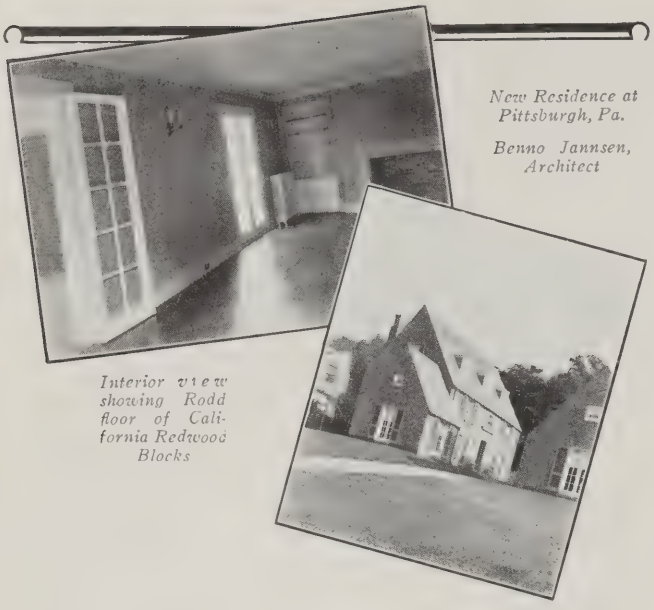

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Benno Jannsen, Architect

Interior view showing Rodd floor of California Redwood Blocks

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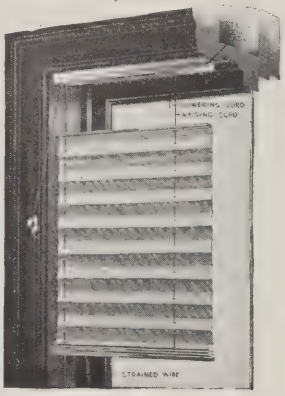

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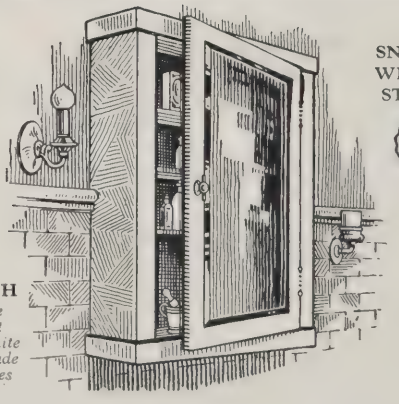

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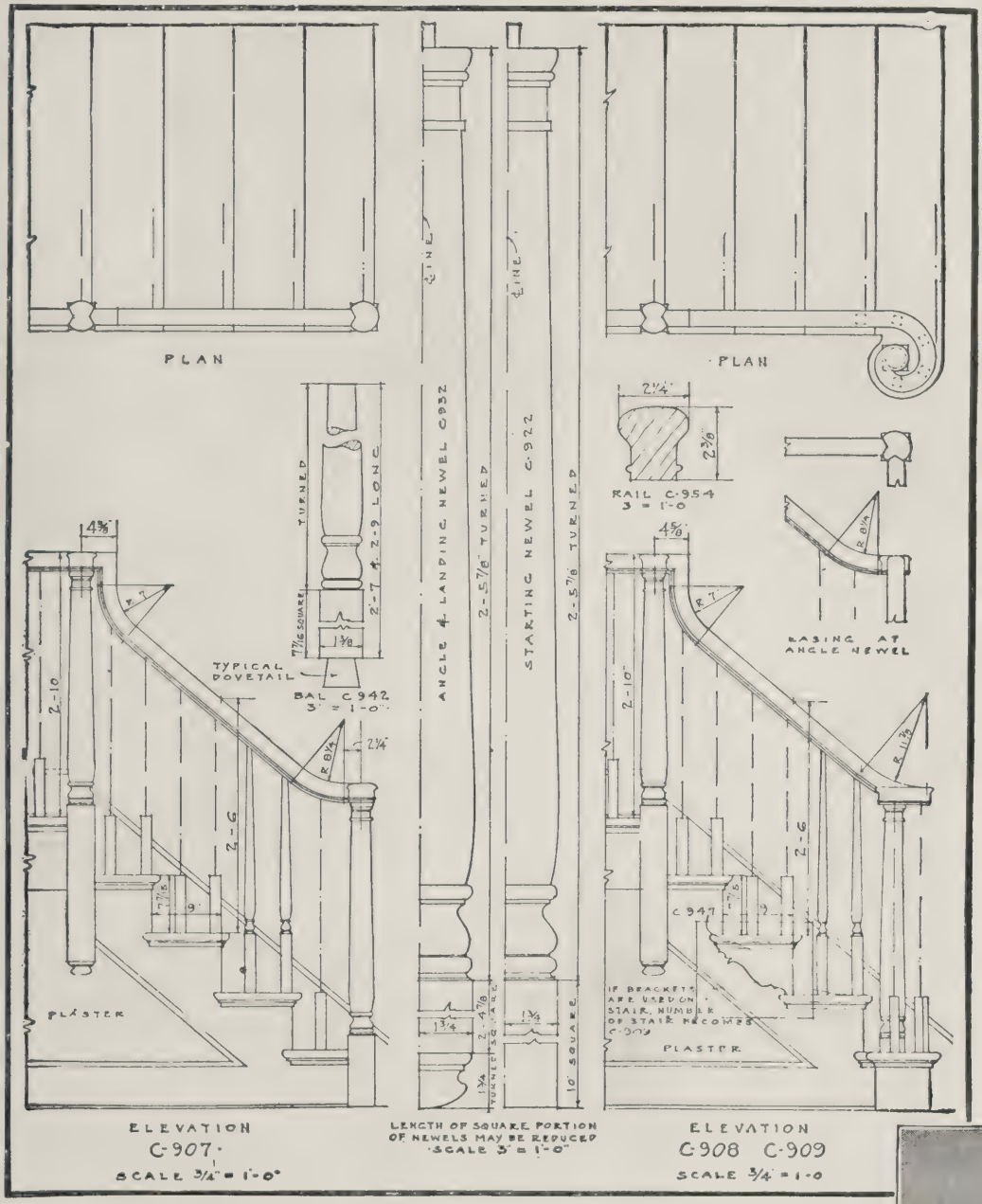
See Our Catalogue in Sweet's—pages 1786-1787

HESS CABINETS and MIRRORS

Snow-White Steel



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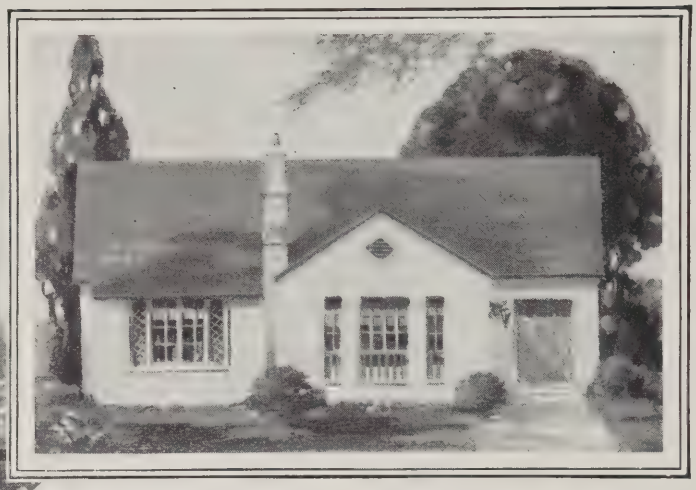

A home at Longview, Washington— A. N. Torbitt, Architect.

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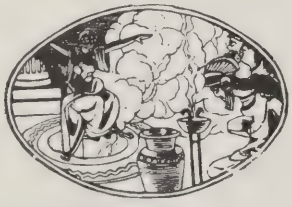

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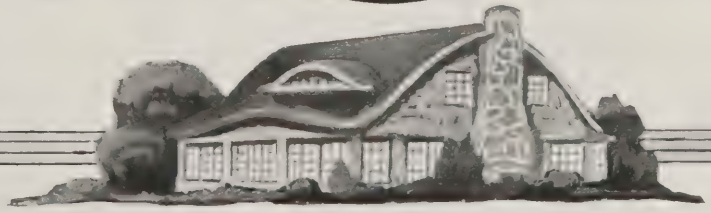

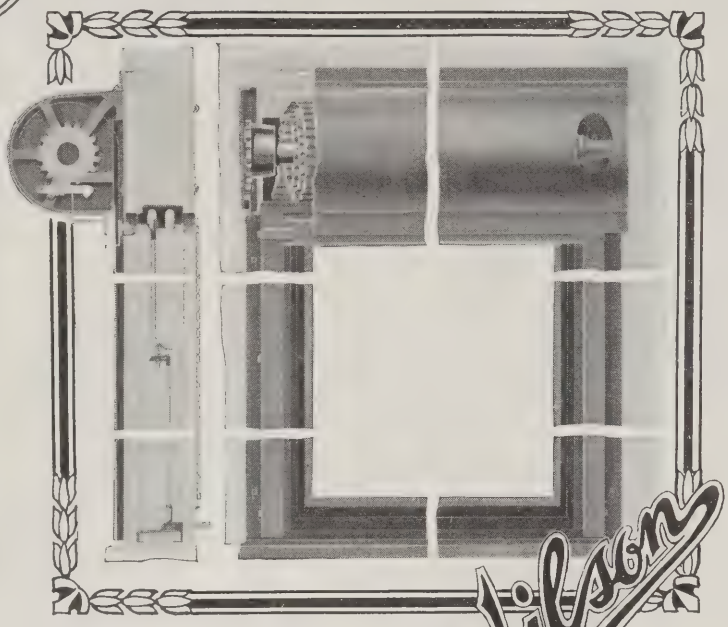

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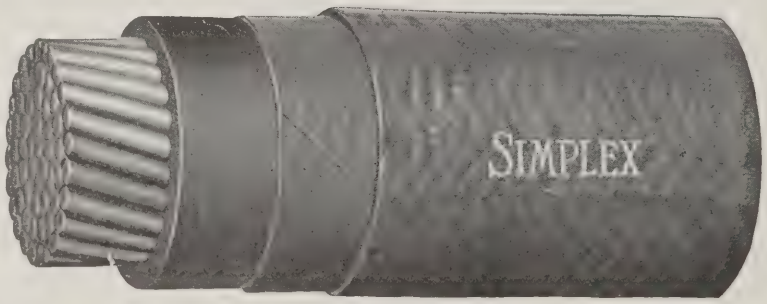

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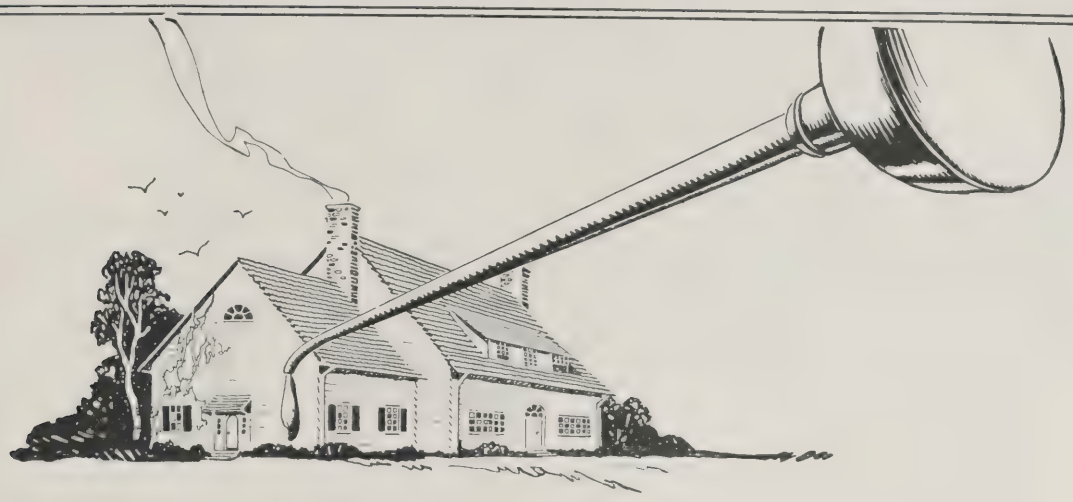
If a house could be oiled——



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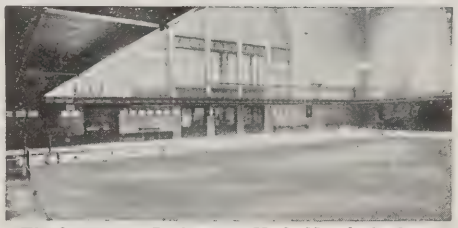

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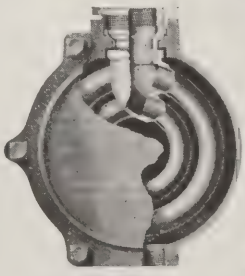

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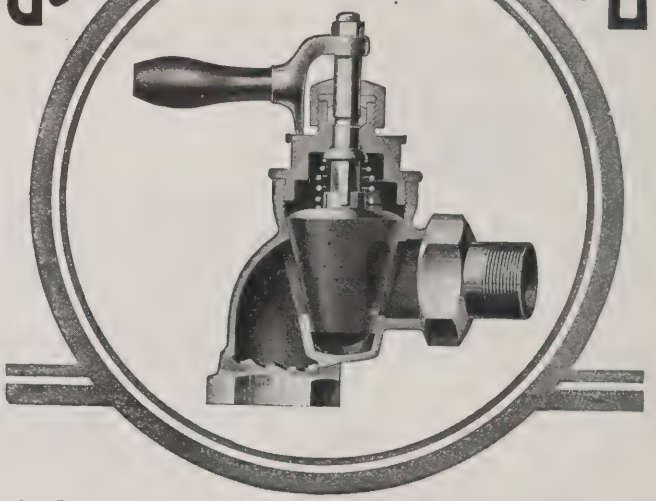

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The Pipe Basis for Modern Building

ANY survey of the architecture of the South will show the state of Georgia and the city of Atlanta taking high rank. Manufacturers whose high quality products are selected for structures of the superior character of those illustrated have a justifiable pride in the building achievements of this city and state.

The buildings illustrated are taken from Bulletin No. 25 "NATIONAL" Pipe in Large Buildings. The new edition of this publication, revised and enlarged, will be sent upon request.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.

DISTRICT SALES OFFICES IN THE LARGER CITIES

Through Earthquake and Fire!

IN 1919 the Japanese Government appointed a commision to study European and American building methods. The commission was so favorably impressed with American buildings, that a New York firm was invited to organize the Geo. A. Fuller Co. of the Orient, Ltd., their first work being the erection, in Tokio, of the two giant structures illustrated above.

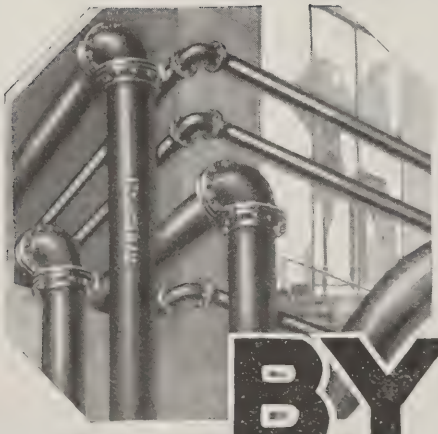
These buildings were nearing completion when the disastrous earthquake and fire occurred. American building methods scored their crowning triumph when these structures emerged with amazingly small damage from the most terrible catastrophe in recorded history.

The larger of these buildings, the Marunouchi Building, now stands amidst devastation and ruin, a modern office building of gigantic proportions, a typical American steel frame structure.

The other edifice is the mammoth headquarters of the Nippon Yusen Kaisha. Both of these buildings contain all modern conveniences and safeguards to life and property, such as passenger elevators, electric light, plumbing, heating and other pipe systems. These latter include a number of services found only in the best equipped American business buildings, namely:

Heating System	*Byers Pipe*
Cold Water Supply Lines	*Byers Pipe*
Hot Water Supply Lines .	*Byers Pipe*
Fire Lines	*Byers Pipe*
Sprinkler System	*Byers Pipe*
Refrigeration System .	*Byers Pipe*
Drinking Water Lines aud Other Services . .	*Byers Pipe*
Vacuum Sweeper Lines.	*Byers Pipe*

It will be noted that, with due recognition of its surpassing anti-corrosion properties, Byers pipe was chosen for all but one of the above services in both buildings.



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GENUINE WROUGHT IRON

Look for the Name and Year rolled in every length

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"'Reading' on Every Length"

Pipe corrosion is no respecter of persons or property

CORROSION is but another name for rust. In every hotel, home, office building and factory there are from hundreds to many thousands of feet of pipe, and along every foot of every pipe, corrosion is seeking for a weak spot—some flaw that will give it a foothold. And once corrosion gets a foothold, a leaky pipe is only a matter of time.

Tonight, somewhere, the gaily decorated ceiling of some hotel dining room may suddenly treat the comfortable diners to a shower bath—or your own dining room at home may be the scene of some such occurrence. Tomorrow morning you may find your office or your factory has sustained water damage from leaking pipes.

A pipe leak heretofore may have meant only a plumber's bill to you. Next time the damage may be more serious. You cannot *stop* pipe corrosion once started, but you *can* guard against it by the use of Reading Genuine Wrought Iron Pipe. "Reading" offers two to three times the resistance to rust that steel pipe does. "Reading's" life is two to three times as long. Its "per year" cost is one-half to one-third the price of steel.

When you build or remodel or when you replace pipe it is the part of wisdom to specify "Reading"—the pipe that *endures* Write today for "The Ultimate Cost."

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World's Largest Manufacturers of Genuine Wrought Iron Pipe

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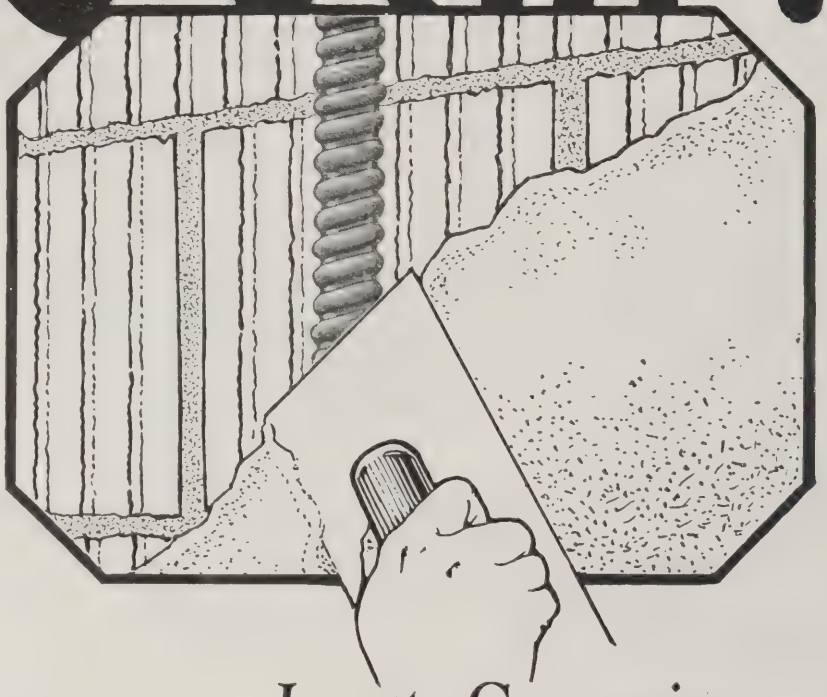
Ovalflex



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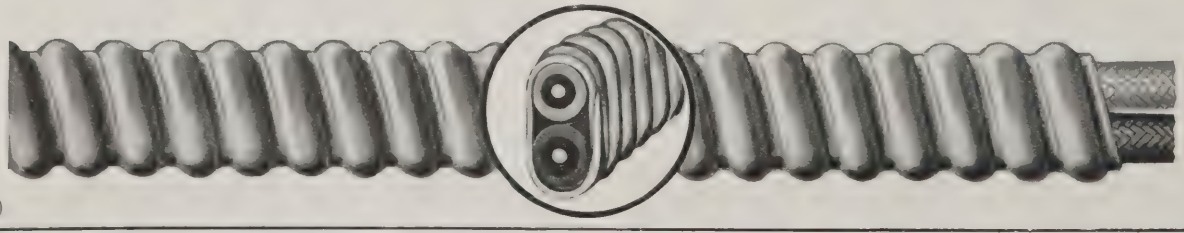
OVALFLEX—an armored cable flat in shape and extremely flexible—can be laid directly on the surface of brick, tile or concrete walls, without cutting or grooving the basic materials, and covered with the usual thickness of plaster.

In many other ways OVALFLEX is meeting the requirements of intricate wiring jobs that cannot be accomplished by the ordinary round armored cable.

Send for Sample—FREE

Our Bulletin No. 800, which describes and illustrates this remarkable product, will be sent on request.

National Metal Molding Company
1404 FULTON BUILDING
PITTSBURGH, PA.

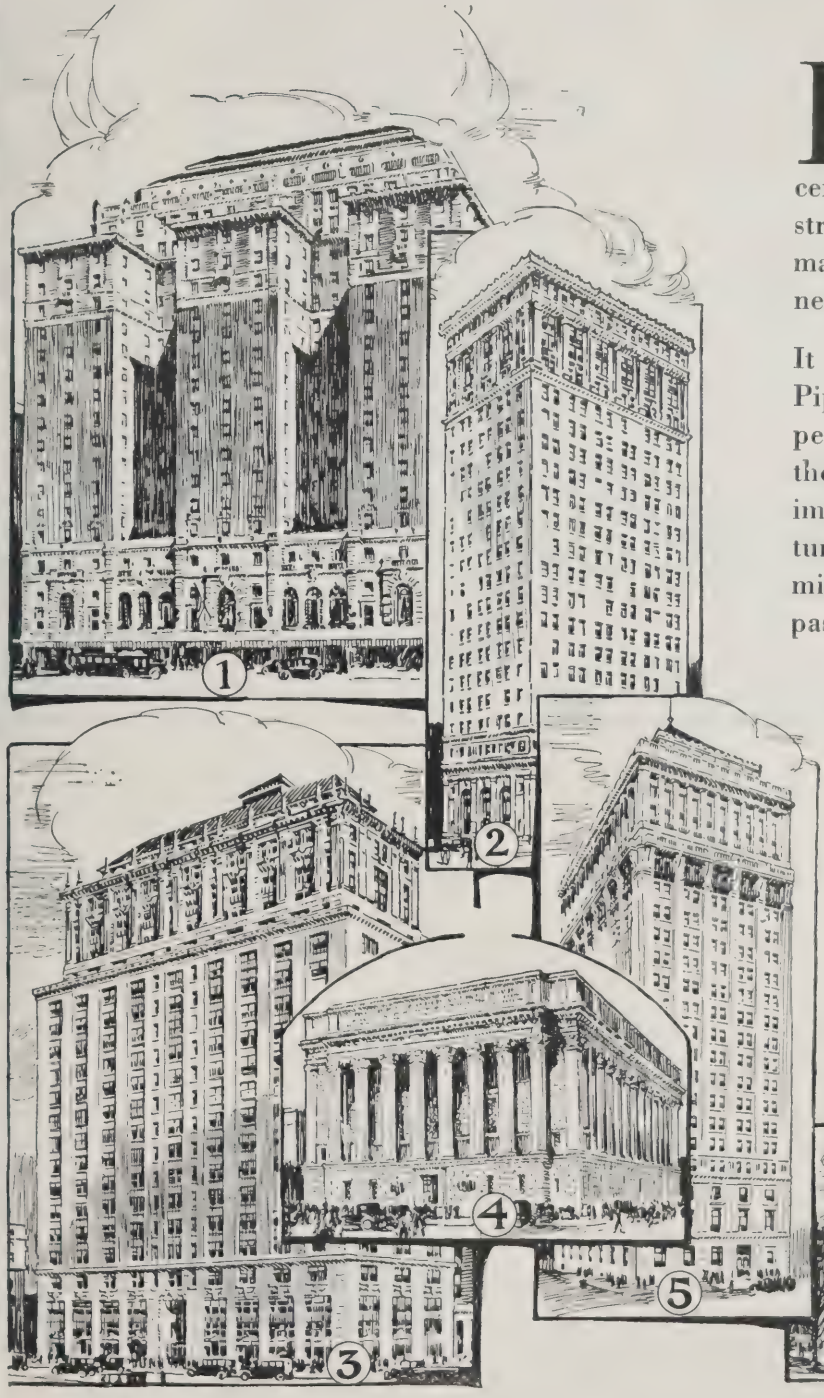


(4)

Bridgeport Plumrite *The Improved* Brass Pipe

REG. U. S. PAT. OFF.

"When Tomorrow Looks Back on Today"



BUILDINGS such as these are illustrative of the architectural development of the century, both in design and construction. They are period landmarks—structures abiding, permanent; not transient or fugitive.

It is fitting that Plumrite Brass Pipe has been chosen to faithfully perform its service down through the years, keeping pace with the imperishable material of the structures themselves long after the minds that conceived them have passed on.

Some of America's finer structures, recently built or now being built under the direction of leading architects, are shown on this page. All have Bridgeport Plumrite Brass Pipe installed.

1—Roosevelt Apartment Hotel, New York
Geo. B. Post and Sons, Architects.

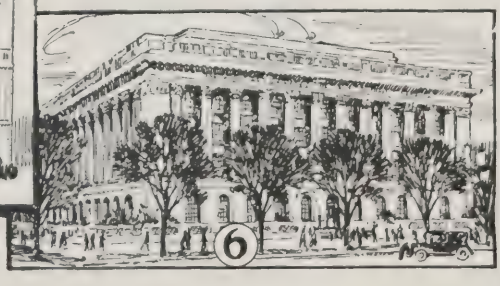
2—Citizens National Bank Bldg., Baltimore
Graham, Anderson, Probst & White, Architects.

3—Park Lexington Building, New York
Warren & Wetmore, Architects.

4—Greenwich Savings Bank, New York
York & Sawyer, Architects.

5—New York Cotton Exchange, New York
Donn Barber, Architect.

6—U. S. Chamber of Commerce Bldg., Washington
Cass Gilbert, Architect



BRIDGEPORT BRASS COMPANY

Pershing Square Building, New York, N. Y.
General Motors Building, Detroit, Mich.

BRIDGEPORT "Bridgeport" CONNECTICUT

North American Building, Philadelphia, Pa.
Wrigley Building, Chicago, Ill.

THE MADVAL BIDET

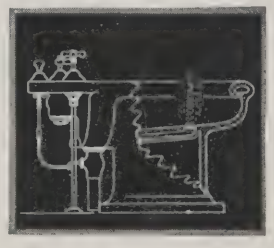
Because of the many advantages it affords for personal cleanliness and health protection, the Bidet is now recognized as a most essential fixture in the modern American bathroom.

The Madval Bidet is a vitreous china fixture—a fixture that embodies all of the sanitary advantages that have characterized Thomas Maddock products for three generations.

Are you recommending this fixture in your plans in order that your clients may benefit by the health protecting advantages that the Bidet provides?

ARCHITECT'S SPECIFICATION: White Vitreous China Flushing Rim Pedestal Bidet Pan; height 15 inches, with Douche and Fixture Shelf. Fitted with N. P. Brass 1¼-inch Pop-up Waste Fixture with China Knob, 1¼-inch O. D. Tailpiece; "Hot" and "Cold" Compression Supply Valves with China Cross-arm Handles and Escutcheons, and Transfer Valve with China Lever Handle and Escutcheon, permitting either "Hot" and "Cold" Supply to Flushing Rim or center Douche; Supply Pipes to floor.

Send for literature describing the use and construction of this fixture.



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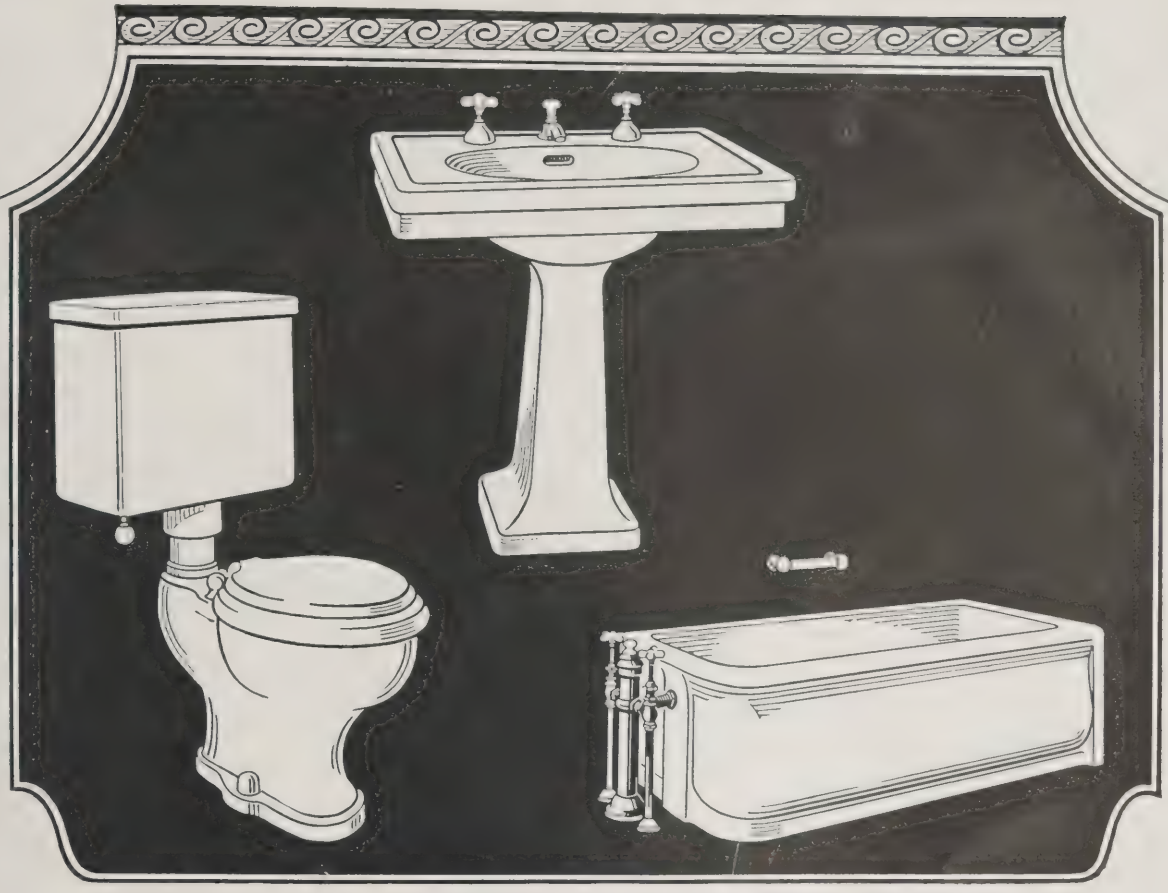
TRENTON, N. J.



PERMANENCY

IN plumbing fixtures permanency is not denoted by a white surface, but by what material is beneath that surface, how conscientiously and with what skill it is made.

"Tepeco" All-Clay Plumbing Fixtures are the highest development of the potter's art. Ware made basically from clay, highly glazed of surface, admittedly has no equal. You will never find indifference to details, skimping of baking processes or laxity in glazing the trade-marked, guaranteed products of this company.

Architects who test by use continue the specification of our goods. They like the absolute assurance that goes with the "Tepeco" trade-mark.

Catalogue R upon request

THE TRENTON POTTERIES COMPANY
Trenton, New Jersey, U. S. A.

NEW YORK BOSTON SAN FRANCISCO

World's Largest Makers of All-Clay Plumbing Fixtures

THE TRENTON POTTERIES COMPANY
TEPECO
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SPINK-ARMS HOTEL, Indianapolis: William K. Eldridge, Architect; Van Camp Hardware & Iron Co. and August Buschmann & Sons, Inc., Jobbers; B. C. Torelle Co. and Vestal Plumbing Co., Plumbers

KOHLER

And the SPINK-ARMS HOTEL

Noteworthy among the newer hotel and apartment buildings of Indianapolis is the Spink-Arms, a residential hotel embodying the most modern thought in design and equipment.

It is another instance of the selection of Kohler Enameled Plumbing Ware, the installation including 236 "Viceroy" built-in baths and the same number of Kohler lavatories and kitchen sinks.

Thus does the steadily lengthening list of important Kohler installations throughout the country almost daily reaffirm the satisfaction of architects in Kohler quality and distinction of design.

KOHLER

This name, unobtrusively fused into the enamel of every Kohler fixture, is a guaranty of genuineness and of these distinctive Kohler qualities—(1) the beautiful snowy whiteness of the durable enamel; (2) the *uniformity* of that whiteness in every fixture.

KOHLER OF KOHLER

Kohler Co., *Founded 1873*, Kohler, Wisconsin
Shipping Point, Sheboygan, Wisconsin

BRANCHES IN PRINCIPAL CITIES

MANUFACTURERS OF ENAMELED PLUMBING WARE AND KOHLER AUTOMATIC POWER AND LIGHT 110 VOLT D. C.

Weathervane on Old Country Club, Flushing, Long Island. Designed by Mr. James R. Marsh.

Figures in Copper Supports in Brass

A Caricature in Copper

"The Golfer and the Caddy," the new weathervane designed by Mr. James R. Marsh for the Old Country Club, Flushing, L. I. (Mr. Arthur W. Coote, architect), is an interesting caricature in Copper.

Mr. Marsh's weathervane exemplifies one of the many decorative and artistic opportunities in Copper and Brass.

Because they are easily worked, it is possible to express in Brass and Copper a wide variety of ideas; the elements of decorative value in the metals are striking; and the range of color attained offers great possibilities for the architect and designer.

Our Building Service Department assisted Mr. Marsh in developing methods of constructing and finishing which have materially reduced the cost of his productions in Copper and Brass.

COPPER & BRASS
RESEARCH ASSOCIATION

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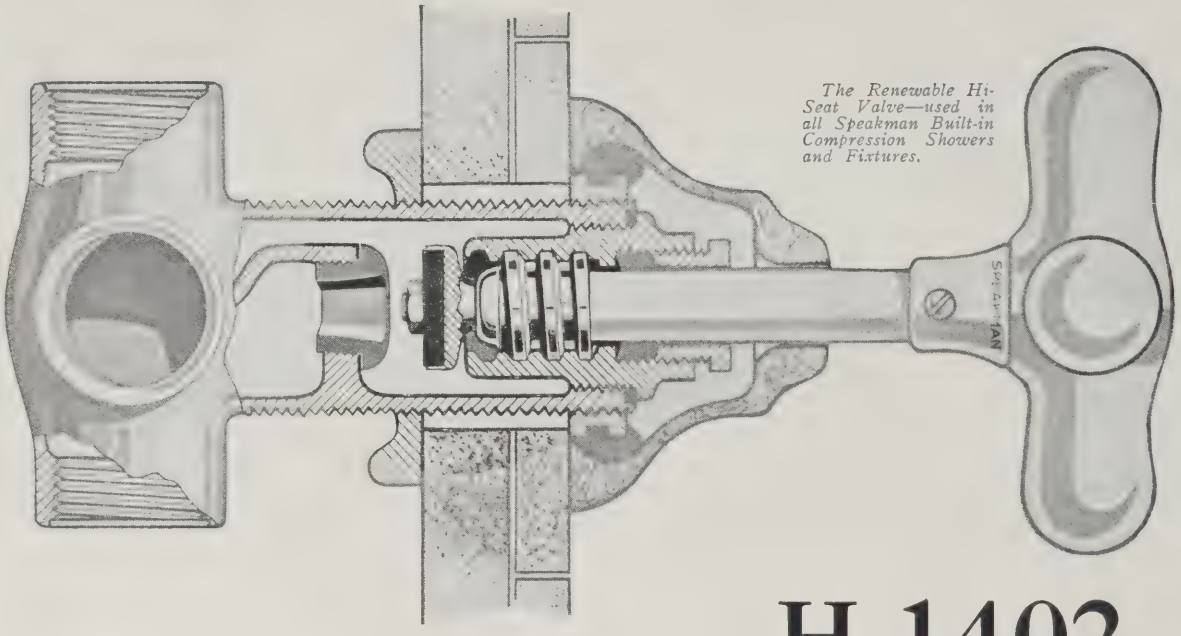
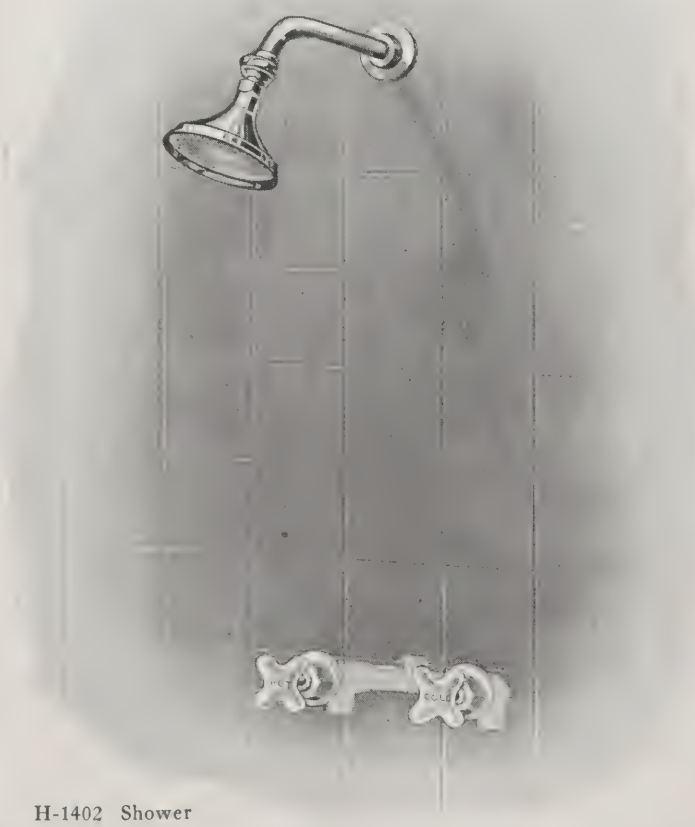


The Renewable Hi-Seat Valve—used in all Speakman Built-in Compression Showers and Fixtures.

H-1402

Compression Valve Shower designed especially for over a tub, in a stall or open battery



H-1402 Shower

WHEN installed over a tub the H-1402 is usually connected to the by-pass valves of the Deshler Bath Fixture or Dupont Tub Filler. The H-1402 similar to all other Speakman built-in showers and fixtures has Renewable Hi-Seat Valves, also all screwed joints are sweated—no chance to leak no matter how strained or pulled when being installed.

Only carefully matched finest American-made china is used in trimming these showers and fixtures, all of which are described and illustrated in our Catalog H. If you haven't a copy in your files, we'll send one promptly.

SPEAKMAN COMPANY
WILMINGTON, DELAWARE

SPEAKMAN SHOWERS

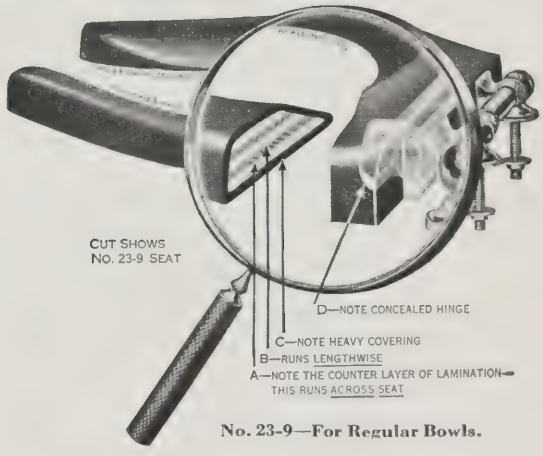
THE BRUNSWICK-BALKE-COLLENDER CO.'S
WHALE-BONE-ITE
SANITARY
CLOSET SEATS

NO RE-FINISHING EVER NECESSARY ON

Whale-Bone-Ite
Toilet Seats

See that *heavy* covering. No amount of cleansing or scrubbing will wear through it.

It's not what you pay—it's the value you get for the amount you spend.



No. 23-9—For Regular Bowls.

Whale-Bone-Ite Provides life-long Sanitary Service at No Cost for Up-keep.

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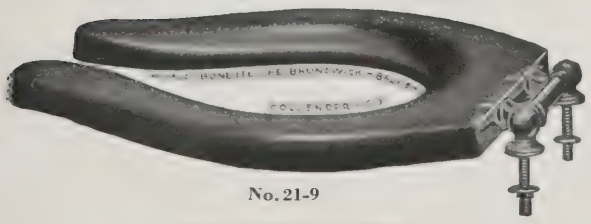
Universally ordered by Architects and Engineers who want *The Best*

Types for all standard makes of bowls



No. 21-9

For Extended Lip Bowls.

Sold by
Leading Plumbers and Jobbers everywhere.

If you cannot secure locally, ask Seat Department of makers.

(See Modern Hospital Year Book, page 381.)

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THE BRUNSWICK-BALKE-COLLENDER CO.
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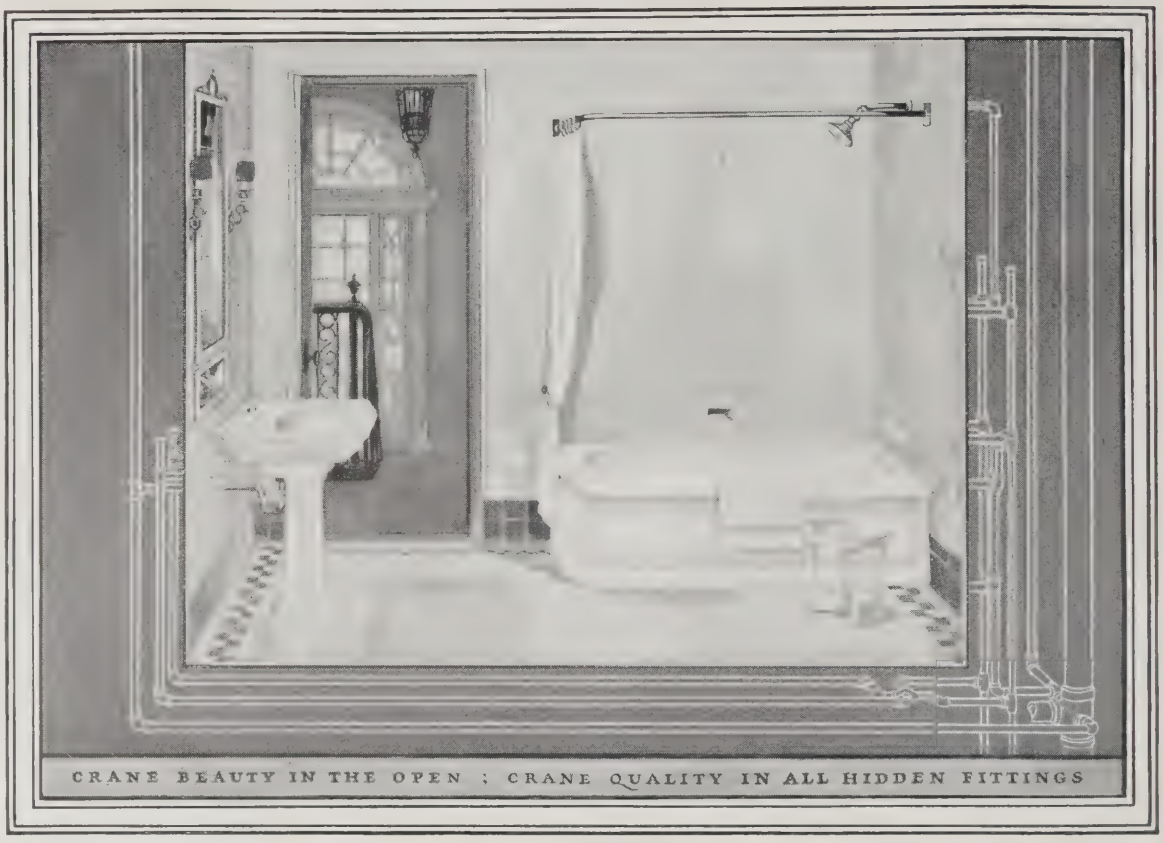

The world-wide use of Crane products under varying conditions for upwards of sixty-seven years, is an indication of the universal acceptance and approval of Crane standards of design and quality.

Since 1855, Crane engineers and designers have labored to promote the progress of the various industries and arts which Crane products serve. The Crane name on valves, fittings and piping specialties used in industrial installations, has become the mark of uniform and dependable quality.

This prestige extends to Crane sanitation and heating fixtures for the home. Meeting the needs of smaller dwellings, Crane equipment also satisfies the exacting requirements of great town and country houses, huge apartment buildings and luxurious hotels and clubs.

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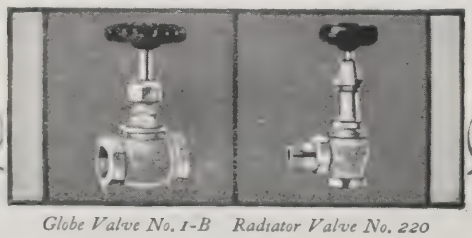

Globe Valve No. 1-B Radiator Valve No. 220

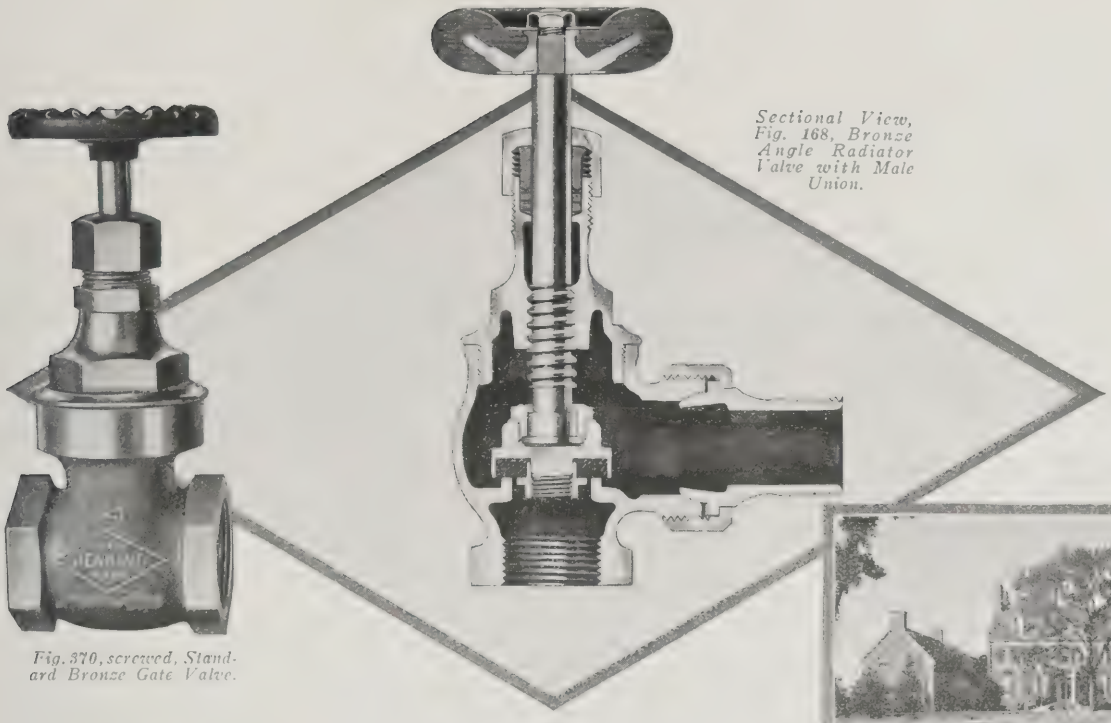

Fig. 370, screwed, Standard Bronze Gate Valve.

Sectional View, Fig. 168, Bronze Angle Radiator Valve with Male Union.

Valves for Homes

The satisfactory operation of heating and plumbing systems depends to a considerable extent upon good valves, and this is especially true in the home, where skilled workmen are not readily available.

Jenkins valves provide ever-dependable service for many years—just the sort of service the home-owner needs and appreciates. They are used in plumbing and heating systems in thousands of homes, a few of which are illustrated.

To provide this *good* valve service, specify "Jenkins."

Valves in bronze, iron and steel for all requirements.

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80 White Street.....New York
524 Atlantic Avenue.....Boston
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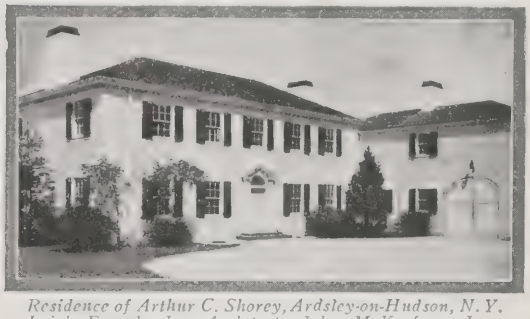
Residence of T. H. Frothingham, Esq., Far Hills, N. J. Office of John Russel Pope, Architects; Stevenson and Cameron, Contractors; Joseph Miller, Plumbing.



Residence of Arthur C. Shorey, Ardsley-on-Hudson, N. Y. Leigh French, Jr., Architect; John McKeefrey, Inc., Builders.

Residence of Carl L. Hamilton, Esq., St. Paul, Minn. Russell F. Whitehead and John M. Wheeler, Associate Architects; Paul Chapel, Plumber.

Jenkins Valves

SINCE 1864

Manufacturers' Catalogs

THE MASSILLON STEEL JOIST CO., Massillon, Ohio. "Massillon Bar Joists."

The necessity of having fireproof floors in a building of any considerable size, such as a hotel, office structure, apartment house, hospital or school, has ceased to be a subject for discussion, and the question today is how to secure the best floor at the least cost. The solution of the problem is of course quite likely to involve the use of steel floor joists, which can be made of any desired dimensions, of strength calculated to bear any floor load, and adapted to any one of the several methods of floor construction.

Considerable useful data and much information of a valuable sort are given in this brochure, which is devoted to the "Massillon Bar Joist." This joist is being made with a view of effecting economy in every possible way which does not involve any sacrifice of quality or value. Thus there is economy of material used; economy of hours of labor, either at the plant in making the joist or at the site in erecting it; saving in transportation costs on merchandise which is necessarily of great weight, but perhaps more important still, economy which takes the form of so designing floor joists that efficiency of design substitutes for sheer bulk or quantity of steel, thus making for greater economy of cubage within the structure. Almost as important as the data and the other information given in this brochure are the numerous illustrations showing structures at various stages of erection and affording an excellent idea of what constitutes the best present-day practice.

THE KAESTNER & HECHT COMPANY, Chicago. "Bulletin No. 500, Electric Traction Elevators."

It is popularly supposed that the erection of the tall modern building is due entirely to the discovery of the system of steel construction by which the actual weight of a building is supported by a framework or skeleton of steel; but this method of building could never have become as valuable as it has proved had it not been for the almost simultaneous development of the possibilities presented by the elevator. Imagine, for example, the use in a 40- or 50-story structure of the elevators in vogue 25 years ago—elevators which were thought to be of inestimable value in that they made it unnecessary to walk up!

The improvement of the elevator is due very largely to the application to it of electricity as motive power. The use of electricity makes for speed and smoothness of operation; for economy in administering elevator service; for cleanliness, order and other highly desirable qualities, and the elevator has now been brought to a point so closely approaching perfection that much further improvement seems to be impossible. Perhaps like the manufacture of automobiles the making of elevators has been so developed that further radical changes are hardly to be expected, and that only minor changes and further refinement and small improvements are possible. The utmost in service has been reached.

This brochure and various folders and leaflets which come enclosed with it go quite fully into discussing the electric traction elevators furnished by the Kaestner & Hecht Co. Architects who are interested in elevator installation are likely to be well informed as to their operation, and those who actually install elevator equipment are without doubt quite familiar with methods of installation, but both architects and installation men will be able to gather much data of value from these well-presented publications, and they contain many illustrations and considerable information regarding installations.

THE KERNER INCINERATOR CO., Milwaukee. "The Sanitary Elimination of Household Waste." "Sanitary Disposal of Waste in Hospitals."

There is no detail connected with the sanitation which is of such importance today as the proper disposal of garbage. In a large city, of course, solution of the problem is undertaken by the municipality, which gathers garbage each day and disposes of it generally by burning it in furnaces which are maintained by the city. Such an easy solution of the individual housekeeper's problem, however, is not possible except in a city or large town, and even when it is it involves the keeping of offensive and highly unsanitary cans, and garbage collectors have been known to fail to make their appointed rounds. Anyone who has lived in New York through a "strike" of garbage collectors during the heat of summer and, since there are no alleys, seen uncovered cans of garbage a week old piled on the sidewalk in front of the house, would realize that a municipality's tackling of the problem is not always a success. Better by far some solution by which the householder is independent of such service in connection with the disposal of garbage.

These folders describe the well known "Kernerator," a device for garbage disposal which is economical and convenient and which is being installed in many buildings of a residence or semi-residence character. In a residence or apartment, for example, there is but one handling of garbage of any kind; all that is seen in the kitchen, pantry or rear hall is the door of the hopper through which garbage is dropped by means of a chute (built in part of an enlarged chimney) into the incinerator, which is provided with a special arrangement of grates and flues so that the garbage is easily and quickly burned. By a special arrangement of grates, oxygen is fed to the flames at the top of the burning material, and so the fire is always on top of the material being incinerated. As the heat liberates gases from the material underneath, these gases pass up through the flames, are mixed with the plentiful supply of heated oxygen at that point, and are consumed. There is always a strong draft into a chimney from the building. When a hopper door in the kitchen

DOUGLAS
PLUMBING FIXTURES

In the Nation's Capitol

HUNDREDS OF U.S. GOVERNMENT BUILDINGS THROUGHOUT THE LAND ARE EQUIPPED WITH DOUGLAS FIXTURES

THE JOHN DOUGLAS CO.
MANUFACTURERS OF HIGH GRADE PLUMBING FIXTURES
GENERAL OFFICE—CINCINNATI O.

is opened, there is a strong pull of air into the flue from the kitchen. There is never a possibility of heat or smoke escaping into the kitchen, since the suction of the draft prevents that.

If the utmost care is desirable in handling refuse from the kitchen of the house, of what vital importance is the disposal of refuse of many kinds from the different departments of a hospital! A hospital, of course, presents problems not always met when a "Kernerator" system is installed in a house or apartment building, and there are special forms of the "Kernerator" for such institutions.

THE COMPOUND AND PYRONO DOOR CO., St. Joseph, Mich. "Architects' Hand Book."

The precautions against the spread of fire which are taken when an important structure of almost any kind is built quite naturally make considerable provision for fireproof doors, which are necessary for controlling entrances or exits through which fire might easily spread, and the purpose of this handbook is to place before architects, builders and others interested the advantages to be secured by using the fireproof doors, trim, and other details of Pyrono manufacture.

The Pyrono process is a well known mechanical method of fireproofing wood cores in the manufacture of interior finish. Cores are first covered with a fireproof sheathing made of pure asbestos, which by heavy pressure at numerous points, is indented into the core wood. The fireproof sheathing in permanent contact with the core excludes oxygen essential to combustion, preventing ignition, and at the same time permitting, through small openings at the base of the indents, the escape of gases developed from the core wood under high temperatures. Over the indented asbestos sheathing are laid wood veneers, which in gluing are brought into direct contact with the core through the indents.

Pyrono doors and trim are installed by carpenters, and hardware is applied just as for wood doors. The same treatment in finish is also obtained. Pyrono should therefore be included in the specifications for carpenter work.

FEDERAL CEMENT TILE CO., 11 South Dearborn Street, Chicago. "Covered with Federal."

The great cost of present-day building renders it especially necessary that the structure be fully protected by its roof from injury or deterioration of every kind, and economy of administration requires that this protection be secured with as small as possible an expense for "upkeep." One phase of a roof's durability concerns, of course, its absolute fireproofness, and if all these numerous advantages can be had, and if at the same time in addition the roof can be made to admit light and thus function as a skylight, it would seem that there is but little more which could be asked for. This brochure describes two of the roofing materials made by this manufacturing concern, the "Federal Interlocking Tile," a form of stone-concrete roofing, and the "Federal Glass Tile," of which a roof may be built wholly or in part.

Neither heat, cold, fire nor water can affect this Federal Interlocking Tile. Gases, so destructive to some other roofs, only tend to harden it. Reinforcing wire mesh is so deeply imbedded in specially prepared concrete that it is absolutely immune to corrosion. The unit system, with its interlocking joints, makes every slab free to move as a result of vibration, expansion and contraction; yet joints are at the same time hermetically sealed, eliminating the need for the waterproof composition covering and painting required by certain other types of roofing.

Daylight has no rival—and there is no way of introducing daylight into a shop or factory that can compare with toplighting through the roof surface. This ideal lighting is accomplished by Federal Glass Tile. These tile interlock with the remainder of the tile forming the roof, and can be so distributed as to admit light either diffused over large spaces or concentrated on any exacting operation. In each glass tile is imbedded a pane of quarter-inch wire glass, measuring 21x35 inches. A special process provides for expansion and contraction. There are no puttied joints to fail or metal frames to rust out.

THE NORTHWESTERN EXPANDED METAL CO., Chicago. "Specifications for Metal Lath Construction." "Fireproof Construction." "Designing Data."

These three helpful brochures have to do, as their titles suggest, with different phases of the rapidly increasing use of metal lath. The first mentioned booklet is valuable since it gives the specifications recommended for use by the American Specification Institute and the Associated Metal Lath Manufac-

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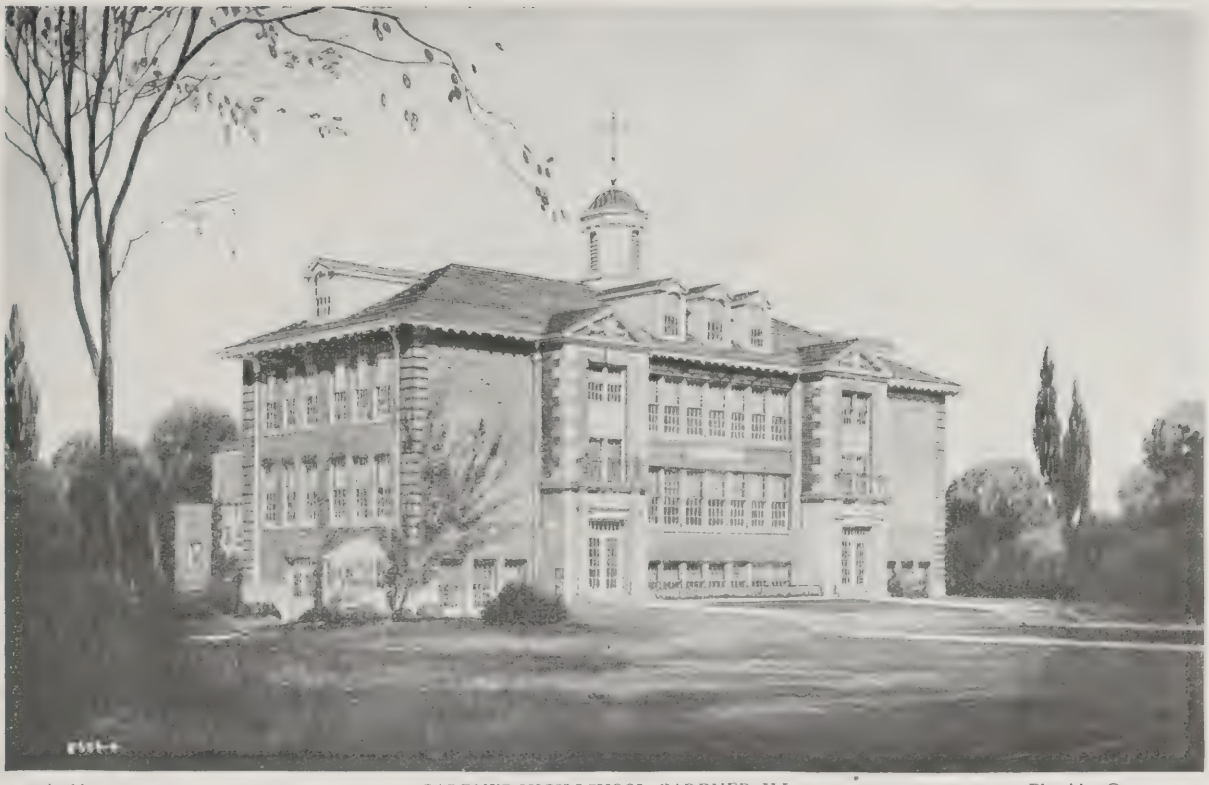

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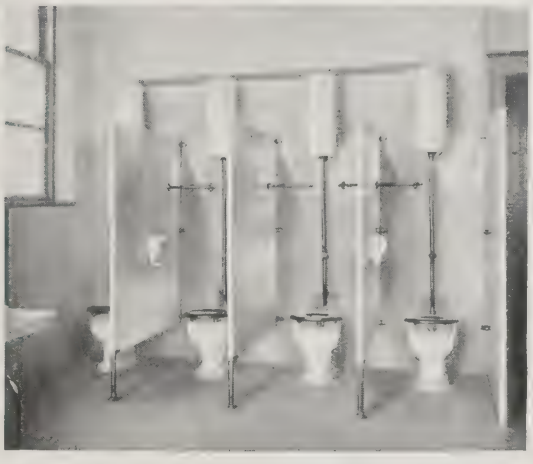

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turers which, it is hoped will make for unity in the use of the material. These recommended specifications are the net result of many months spent in investigating the specifications of leading architects, of much inspection of actual construction in various parts of the country, of research into scores of building codes, and of data compiled from questionnaires sent to representative contractors, all this being in addition to the recommendations heretofore put out by individual manufacturers.

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ANNOUNCEMENTS

J. C. Niemeyer, Architect, announces his removal to new offices at 107 East Third street, St. Paul.

John Graham, Architect, announces the removal of his offices to the Dexter Horton Building, Seattle.

Glenn Allen, Architect, announces his removal to the Union Block, 41 South Sutter street, Stockton, Cal. Manufacturers' catalogs are desired.

R. J. Martin announces the opening of his office for the practice of general building design and erection, specializing in reinforced concrete, at Fairbanks Bldg., Springfield, Ohio.

David A. Ogilvie, Architect, formerly identified with the office of Reginald D. Johnson, Architect, announces that he has established an office at 100 East Colorado street, Pasadena.

Samuel Lewis Malkind and Martyn N. Weinstein, Architects, announce their removal from 16 to 105 Court street, Brooklyn. Manufacturers' catalogs and samples are requested.

E. G. and C. J. Kaltenbach announce the opening of their office at 201 Board of Trade Bldg., Wheeling, W. Va., for the practice of civil and architectural engineering. Manufacturers' catalogs and samples are requested.

Hallam L. Movius, Landscape Architect, announces that he has established his Boston office at 11 Beacon street.

Morris W. Maloney, Architect, has removed from 145 Chestnut street to 23 Pearl street, Springfield, Mass. Manufacturers' catalogs are requested.

Leslie H. Allen has become associated as partner and business manager with Russell Barr Williamson, Architect, 405 Broadway, Milwaukee.

Hoener, Baum & Froese, Architects and Engineers, announce the removal of their offices from 1519 Federal Reserve Building, to the Grand-Laclede Building, Grand boulevard and Laclede avenue, St. Louis.

Saul E. Moffie, structural engineer, is now associated with Max Maltzman, architect, under the firm name of Maltzman & Moffie, Architects and Engineers, 51 Cornhill, Boston. Manufacturers' catalogs and samples requested.

George Herbert Gray, successor to L. W. Robinson, of New Haven, and Clark J. Lawrence, of New York, announce the formation of the partnership of Gray & Lawrence for the practice of architecture and community planning at 42 Church street, New Haven.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF THE ARCHITECTURAL FORUM, Published Monthly at New York, N. Y., for October 1, 1923.

State of Massachusetts, County of Suffolk, ss.:

Before me, a Notary Public, in and for the State and county aforesaid, personally appeared Albert J. MacDonald, who, having been duly sworn according to law, deposes and says that he is the editor of THE ARCHITECTURAL FORUM and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, to wit:

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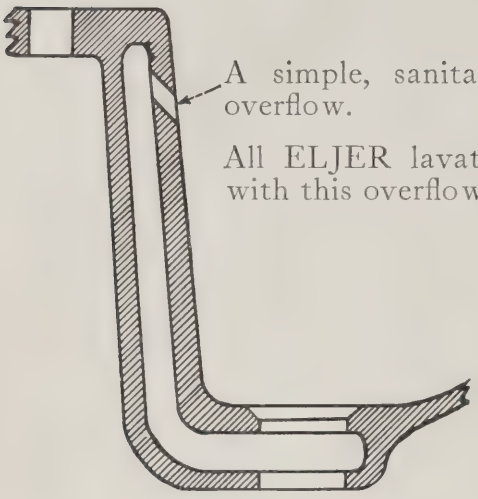

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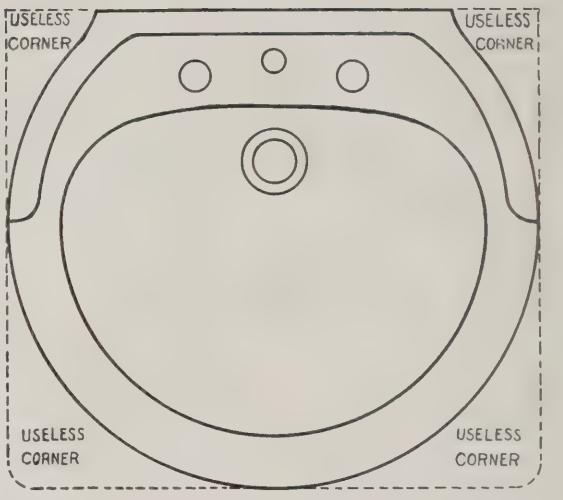

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